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The Laboratory Bookshelf*

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"It is hard for me to speak of the value of libraries in terms which would not seem exaggerated. Books have been my delight these thirty years, and from them I have received incalculable benefits. To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all." (From remarks on *Books and Men* by Sir William Osler at the opening of the new building of the Boston Medical Library, 1901.)

The library of the Division of Laboratories and Research of the New York State Department of Health, established by Dr. Augustus B. Wadsworth in 1914 as a vital, functioning unit, has enjoyed continuous support of the state's appropriating bodies. From the shelves of this library whose sources are world-wide, I have made a choice of a "laboratory bookshelf" which perforce is largely personal and should in no sense be considered exclusive. The list is one conception of a nucleus without which a complete public health laboratory, no matter how small, would to some extent be handicapped. A consideration of foreign language literature has been omitted because of the regrettable absence of linguistic proclivities in the average laboratory. In the laboratory field, the need of some facility, especially in German, French, and Spanish is great and while it is met in large measure by the abstract services, the barrier of language is both a professional and cultural handicap.

The encyclopedic interests within laboratories that are large in scope require the support of libraries that encompass all of the fields with which such laboratories are concerned. The public health laboratory in the broadest sense forms the link between the basic fundamentals of science on which the modern prevention and treatment of disease firmly rest and the practice of medicine and public health. To limit the discussion to shelves of the library reserved for a few categories within the whole province of the public health laboratory would be to suggest a limitation of scope of function which is above all to be avoided.

Just as a fine distinction between clinical laboratories and public health laboratories (in the narrow sense) is artificial, so a separation of routine and research laboratories is actually impossible. The routine laboratory is the seed

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bed in which research problems sprout, and a staff which is not alert to the significance of observations in the course of routine work is only half alive. As Louis Pasteur noted, in the fields of observation, chance favors the prepared minds. A laboratory staff, in ignorance of current thought to be found in scientific literature, cannot fulfil its obligations fully or make the most of opportunities. Although the size of the library must be governed by the size of the laboratory, surely books dealing with routine procedures should not be purchased to the exclusion of journals containing critically selected papers in research.

Too often the library is the stepchild of the institution it serves, receiving instead of generous treatment, small sums remaining after expenditures deemed more important have been made. A well paid, competent staff and good equipment are fundamental to any laboratory, but of what avail without the support of the digested knowledge in books and current discussions in scientific journals?

The physical relationship of a public health laboratory to a clinical service should be intimate, and the medical library should support both services, unless the laboratory is large enough to afford a library and a trained librarian of its own. If not, all library services including reference facilities would naturally extend to the laboratory, in which pertinent books and periodicals could be deposited under the immediate responsibility of the director. The laboratory staff more than any other should live with its books. Since the health officer and clinician, in consulting the literature germane to the laboratory, in many cases wishes to include a discussion with the director and senior staff members, a visit to the laboratory for that purpose does not generally entail inconvenience. A full-time medical librarian to keep the library highly functional is to be desired by any institution. The rôle of the librarian in acquiring and administering an adequate "bookshelf" is ably presented in the *Handbook of Medical Library Practice* (American Library Association, 1943), edited by Janet Doe, the distinguished librarian of the New York Academy of Medicine.

Some classic texts are ageless, such as Mallory's *Principles of Pathologic Histology,* with the distinctive indigo binding that can still be spotted on the shelves of most pathologists who trained in the era of this famous morphologist; and also Ewing's *Neoplastic Diseases: A Treatise on Tumors* (Saunders, 1940). But observations must be confined to current texts that are more readily available. There is more than a grain of truth in the contention that as soon as a scientific book is printed, it is obsolete. Thus laboratories that would remain in the van of progress are rich in periodicals; and the key to them must be available—*The Quarterly Cumulative Index Medicus* (American Medical Association, 1927–1949, v. 1–44). This is an author and subject index to over 1,200 periodicals and society transactions in many languages. The annual volume includes a bibliography of important new books, a list of journals indexed, and a list of publishers with addresses. Unfortunately, since 1945 labor difficulties have so delayed publication, that its timely value has been seriously affected.

The laboratory's bookshelf should begin with the dictionaries and allied works. Either Webster's *New International* or Webster's *Collegiate Dictionary,* which, in its 6th edition, 1949, is the largest abridgement, is essential. In the *New International,* the classification and nomenclature in bacteriology have been based on the recommendations of the Society of American Bacteriologists; in chemistry, the terms collected have been facilitated by the material con-

tained in *Chemical Abstracts*. In the field of veterinary science, the publications of the U. S. Department of Agriculture are used as a basis. It follows that the latest editions of medical dictionaries should be on the laboratory bookshelf. Blakiston's *New Gould's Medical Dictionary,* 1949, revised by a distinguished staff of eighty contributors, is comprehensive and authoritative. The Appendix of 137 pages is a convenient reference to anatomic tables, tables of blood constitutents, of enzymes, proteins, etc. Other preferences may be for Stedman's *Medical Dictionary,* edited by Norman B. Taylor, M.D., of the University of Western Ontario (Williams & Wilkins, 17th ed., 1949), with its 35 page section on medical entomology; or *The American Illustrated Medical Dictionary,* by W. A. N. Dorland (Saunders, 21st ed., 1947). The German-English medical dictionary is best represented in Lang's *German-English Dictionary,* edited by M. K. Meyers (Blakiston). Especially useful because there is no current French-English medical dictionary, is Louis De Vries's *French-English Science Dictionary* . . . in agricultural, biological, and physical sciences (McGraw-Hill, 1940); and, similarly his *German-English Science Dictionary* (1946) is a real handbook for the translator. The small *Spanish-English Medical Dictionary,* compiled by Maurice McElligott (Hoeber, 1947), is the most recent aid in medico-surgical terms.

A laboratory library is limited by funds available for purchases, and this fact has been kept in mind. When several texts have been included in the same field, each is considered to offer something not provided by the others.

Pathology: Gray, Henry. *Anatomy of the Human Body* (25th ed. Ed. by C. M. Goss. Lea and Febiger, 1948). The best reference book for the pathologist who wishes to compare the organs and the relationships of structures found at autopsy with the norm. Karsner, H. T. *Human Pathology* (7th ed., Lippincott, 1949). This new edition of a textbook which was first written by the author almost twenty-five years ago is an extensive revision with many new illustrations. Although rivalled by other excellent textbooks of pathology, this one is unsurpassed in the general treatment of morphologic and dynamic pathology. Moore, R. A. *A Textbook of Pathology* (Saunders, 1944). This book is also stimulating in that it approaches pathology as a dynamic study. A large share of the book is devoted to special pathology, and diseases are grouped as to etiology, if known; the diseases of unknown cause are handled separately. Boyd, William. *The Pathology of Internal Diseases* (4th ed., Lea and Febiger, 1944). This is a textbook for the clinician as well as the pathologist. The author has been eminently successful in not only describing pathologic processes but relating them to symptomatology. Willis, R. A. *Pathology of Tumors* (Mosby, 1948). For the oncologist, this encyclopedic text on tumors, written by a British expert with customary fluent style, makes enjoyable reading and covers the broad subject of tumor pathology admirably by systems. Anderson, W. A. D. *Pathology;* with 1183 illustrations and 10 color plates (Mosby, 1948). This massive compilation of papers by authorities in virtually every field of pathology covers in a remarkable way not only general tissue pathology but the individual specialties as well. Karsner, H. T., and Lund, H. Z. *The Year Book of Pathology and Clinical Pathology* (Chicago, Year Book Pub.). This little book contains a digest of significant papers appearing during the preceding year. Maximow, A. A., and Bloom, William. *A Textbook of Histology* (5th ed., Saunders, 1948). An excellent book, serving a purpose comparable to Gray's *Anatomy* beside the pathologist's microscope. Lillie, R. D.

Histopathologic Technic. (Blakiston, 1948). Glick, David. *Techniques of Histo- and Cytochemistry: A Manual of Morphological and Quantitative Micro-Methods for Inorganic, Organic, and Enzyme Constituents in Biological Materials* (Interscience Pub., 1949). Good recent texts in technical methods in this field are scarce and these are excellent. Cowdry, E. V. *Laboratory Technique in Biology and Medicine* (2d ed., Williams & Wilkins, 1948). A handbook of histologic methods of particular value as an easy reference to special stains. Saphir, Otto. *Autopsy Diagnosis and Technic* (2d ed., Hoeber, 1946). A complete and full description of a widely accepted technic of post-mortem examination which is useful for the beginner and reminds the experienced of details that should not be overlooked. Gonzales, T. A., Vance, Morgan, and Helpern, Milton. *Legal Medicine and Toxicology* (Appleton-Century, 1937). There is a common interest in public health laboratories and medical examiners' laboratories; in fact, in some localities, the two have virtually merged.

Clinical Pathology: Todd, J. D., and Sanford, A. H. *Clinical Diagnosis by Laboratory Methods* (11th ed., Saunders, 1948). This textbook is seen open on the laboratory bench perhaps more than any other. It describes the best of the recognized technics in an orderly and explicit manner which is welcomed by laboratory technicians. The chapter on serologic tests for syphilis represents, in our opinion, an unsuccessful attempt to handle in eighty pages a difficult and controversial subject; it includes a description of seven different technics. The section on cerebrospinal fluid examinations is not good. However, the chapters on the examination of urine, blood, gastric contents, feces, etc., are very useful. Simmons, J. S., and Gentzkow, C. J. *Laboratory Methods of the United States Army* (5th ed., Lea and Febiger, 1944). Twenty-five experts contributed to the writing of this text, and although it is an excellent practical laboratory manual, the caliber of the different chapters is variable and the text must be used with discrimination. Sunderman, F. W., and Boerner, Frederick. *Normal Values in Clinical Medicine* (Saunders, 1949). This new textbook fills a need in both laboratory and clinical medicine. As the authors point out, although the need for ascertaining values that constitute the "norm" have been clearly recognized, practically no attempt has heretofore been made to select and assemble such pertinent data into a comprehensive unit. This new book should prove to be of great reference value.

Hematology: Wintrobe, M. M. *Clinical Hematology* (2d ed., Lea and Febiger, 1946). A complete, authoritative textbook.

Blood Transfusion: deGowin, E. L., Hardin, R. C., and Alsever, J. B. *Blood Transfusion* (Saunders, 1949). A new and excellent book by three authorities who contributed much to the advancement of transfusion services in both military and civilian medicine.

Applied Physiology: Best, C. H., and Taylor, N. B. *The Physiological Basis of Medical Practice* (3d ed., Williams & Wilkins, 1945). Metabolism and endocrinology usually are considered to be in the clinical field but they fall within the scope of some public health laboratory services, and for them this encyclopedic text is recommended.

Bacteriology: Bergey's Manual of Determinative Bacteriology, sponsored by the Society of American Bacteriologists and compiled by Breed, R. S., Murray, E. G. D., and Hitchens, A. P. (6th ed., Williams & Wilkins, 1948). This old book continues in a new edition to serve usefully its purpose in establishing bacteriologic nomenclature. Topley, G. S., and Miles, A. A. *Topley and Wilson's Principles of Bacteriology and Immunity* (3d ed., 2 v., Williams & Wilkins, 1946). No bacteriologic lab-

oratory should be without this British text which combines authoritativeness with easy readability. The work is divided into four parts: I. General Bacteriology; II. Systematic Bacteriology; III. Infection and Resistance; IV. The Application of Bacteriology to Medicine and Hygiene. Particularly useful are the thumbnail sketches of the chief characters of each microörganism, found at the end of the chapters in Part II. Dubos, R. J., ed. *Bacterial and Mycotic Infections of Man* (Lippincott, 1948). This text is a compilation of chapters written by authorities on the more important species of bacteria and in the field of medical mycology, ably edited. The excellent typography and photographs enhance the value of the text. Rivers, T. M., ed. *Viral and Rickettsial Infections of Man* (Lippincott, 1948). This companion volume to Dr. Dubos's book is also by several experts and merits equal commendation. In addition to clinical and pathologic pictures in natural and experimental hosts, this volume includes sections on epidemiology and control measures. Both books were subsidized by the National Foundation for Infantile Paralysis. *Diagnostic Procedures for Virus and Rickettsial Diseases* (American Public Health Association, 1948). A collection of laboratory methods by a score of experts. It ties together work in a field that is still unfamiliar to many laboratory workers. New methods are developing so rapidly, however, that this book cannot be used exclusively as a current guide.

Tropical Diseases: Belding, D. L. *Textbook of Clinical Parasitology* (Appleton-Century, 1942). A good book for the laboratory worker with little experience in parasitology. Descriptions are clear and the material is easily understood. Craig, C. F., and Faust, E. C. *Clinical Parasitology* (4th ed., Lea and Febiger, 1945). An authoritative reference book by experts in the field. Faust, E. C. *Human Helminthology: A Manual for Physicians, Sanitarians, and Medical Zoologists* (3d ed., Lea and Febiger, 1949). Many of the significant findings included in this recent revision resulted from investigations during military operations in warm climates between 1942 and 1945. This is a timely and welcome publication. Wilcox, A. C. *Manual for the Microscopical Diagnosis of Malaria in Man* (National Institutes of Health Bulletin No. 180, 1942). This famous little booklet with graphic illustrations in color deserves special mention. Ash, J. E., and Spitz, Sophie. *Pathology of Tropical Diseases* (Saunders, 1945). A beautifully illustrated atlas giving a resumé of the clinical and pathologic features of the more important diseases of the tropics, many of which are also of importance in temperate climates. Life cycles of parasites are charted. Stitt, E. R., Clough, P. W., and Branham, S. E. *Practical Bacteriology, Hematology, and Parasitology* (10th ed., Blakiston, 1948). This compact text was originally written forty years ago for the laboratory worker traveling to the tropics with few books. It has increased in size, scope, and number of contributors over the years. It draws heavily from the larger, two volume text *Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases*. The book is not restricted to tropical diseases, but serves as a good text on clinical pathology.

Methods: Wadsworth, A. B. *Standard Methods of the Division of Laboratories and Research of the New York State Department of Health* (3d ed., Williams & Wilkins, 1947). Chauvinism would impel us to include this text even if we did not sincerely believe that the detailed description of methods are of value to public health laboratories. As is true in the case of most texts, it is in a continual process of revision as technics are improved. American Public Health Association *Diagnostic Procedures and Reagents* (2d ed., 1945). This text has a purpose similar to that of Standard

Methods. Written by authorities in the Association, it details technics for the laboratory diagnosis and control of communicable diseases. This text is under constant revision, and a new edition is on the point of appearing.

Sanitation: American Public Health Association and American Water Works Association. *Standard Methods for the Examination of Water and Sewage* (9th ed., American Public Health Association, 1946). American Public Health Association. *Standard Methods for the Examination of Dairy Products* (9th ed., 1948). These two books are essential since they contain the technical details for required laboratory examinations. Prescott, S. C., Winslow, C.-E. A., and McCrady, MacH. *Water Bacteriology* (6th ed., Wiley, 1946). A complete discussion of the bacteriology of water and the interpretation of routine bacteriologic examinations is contained in this book. Cox, C. R. *Laboratory Control of Water Purification* (Case - Shepperd - Mann Publishing Co., 1946). This is a reference text on the significance of laboratory examinations and their interpretation as an aid to control of water treatment processes. Whipple, G. C. *The Microscopy of Drinking Water* (4th ed., Wiley, 1927). This reference book on the microbiology of water, particularly the algae in algal and protozoön forms, is indispensable for the laboratory dealing with problems in sanitation. Phelps, E. B., and collaborating authors. *Public Health Engineering* (Wiley, 1948). This is a reference text on the application of laboratory examinations and the control of food and water sanitation. Imhoff, Karl, and Fair, G. M. *Sewage Treatment* (Wiley, 1940). This very good, brief, simple reference text covers the problem of sewage treatment and the application of laboratory examinations to their control. Hammer, B. W. *Dairy Bacteriology* (3d ed., Wiley, 1948). A complete discussion is given of the bacteriology of milk and dairy products, including the significance of laboratory examination and their interpretation.

Chemistry: Hawk, P. B., Oser, B. L., and Summerson, W. H. *Practical Physiological Chemistry* (12th ed., Blakiston, 1947). This textbook is standard for diagnostic laboratories. In its 1300 pages, it contains a wealth of information on newer concepts and procedures in biochemistry, relating them to older ideas and methods. Technical methods are clearly distinguished from principles and calculations by the use of bold faced type. Cantarow, Abraham, and Trumper, Max. *Clinical Biochemistry* (4th ed., Saunders, 1949). This textbook represents a successful attempt to correlate the newer knowledge of clinical chemistry to the practice of medicine. It is an excellent book for the biochemist and internist alike. Peters, J. P., and van Slyke, D. D. *Quantitative Clinical Chemistry, Interpretations;* v. 1 (2d ed., Williams & Wilkins, 1946). The first volume of the second edition of this standard text is now four years old but its companion volume on methods has not yet appeared although the publishers state that it will soon be available. As in the first edition, the current volume on "Interpretations" admirably relates pathological physiology to the normal in terms of quantitative physiological chemistry; but in the laboratories, especially, the appearance of the new volume II is eagerly awaited. Hodgman, C. D. *Handbook of Chemistry and Physics* (31st ed., Chemical Rubber Publishing Co., 1949). An encyclopedia of facts that every laboratory should own.

Animals: Rabbits, mice, and guinea pigs are the animals most generally used in the public health laboratory, and a useful text on their care and maintenance is: *The Care and Management of Laboratory Animals. Handbook of the Universities Federation for Animal Welfare;* with an appendix on Statistical Analysis by Major C. W. Hume, Chair-

man of U.F.A.W. Edited by Dr. A. N. Worden, Director of Research in animal health, University College of Wales (London, Baillière, Tindall and Cox; Baltimore, Williams & Wilkins, 1947). No comparable book on the practice and facilities in American laboratories is available. Perhaps it is in the plan of the National Society for Medical Research. In the meantime, the book is indispensable in laboratories concerned with the use of animals. The appendix on statistical analysis has been called "a masterpiece of expository condensation": "The theory of statistics enables an experiment to be planned so that the maximum of information may be obtained from a limited number of observations, and conversely it serves to minimize the number of observations required for a given conclusion; it has thus a humane advantage in experiments which impose any degree of hardship on experimental animals. Formerly the biologist's only resource for increasing precision was to use more animals, but R. A. Fisher and his school have created a new and powerful technique which has revolutionized the inductive method in this respect." (Fisher, R. A. *Statistical Methods for Research Workers* [10th ed., London, Oliver and Boyd, 1946]; Fisher, R. A. *The Design of Experiments* [4th ed., London, Oliver and Boyd, 1947].) Hull, T. G. *Diseases Transmitted from Animals to Man* (3d ed., Thomas, 1947). As the preface states, the diseases which animals may transmit to man remain of interest to the veterinarian and the physician, the research worker, and the health official. An impressive group of veterinarians and physicians has contributed to this edition which includes newer knowledge of the spread and control of virus and rickettsial diseases.

Statistics: Hill, A. B. *Principles of Medical Statistics* (4th ed., The Lancet, 1948). Statistics are too often ignored even by laboratory workers engaged in research projects involving large numbers of observations. This little book will help the worker untrained in the statistical method to avoid the pitfalls of faulty conclusions. Faddis, M. O., and Grime, H. E. *The Mathematics of Solutions and Dosage, including Simple Arithmetic* (Lippincott, 1948). A simple text of this type is invaluable.

Administrative Practices: Odell, M. K., and Strong, E. P. *Records Management and Filing Operations* (McGraw-Hill, 1947). "Dedicated to those records clerks who file but cannot find." No reason for purchase could be more telling than the dedication. Certainly every laboratory must have good administrative control of its several records.

The remaining suggestions concern scientific periodicals.

Pathology: No laboratory concerned with pathology, bacteriology, and immunology should be without immediate access to the fundamental work in these five journals; *Cancer.* A journal of the American Cancer Society established in 1948 for publication dealing with human cancer — diagnosis, treatment, and research. Edited by Fred W. Stewart, M.D. Includes a classified section, Current Cancer Literature, comprising titles that deal with neoplastic diseases; with abstracts of selected publications (Bimonthly, Hoeber). *American Journal of Pathology.* Official publication of the American Association of Pathologists and Bacteriologists; devoted to the publication of original observations and investigations in the fields of pathology and bacteriology, especially morphologic pathology (Bimonthly, Ann Arbor Press). *Journal of Pathology and Bacteriology.* Official journal of the Pathological Society of Great Britain and Ireland (Quarterly, Oliver and Boyd, Edinburgh). *The British Journal of Experimental Pathology.* Director for the conduct of the journal is Sir Paul Fildes, Sir William Dunn School of Pathology, University of Oxford. It was founded

for the publication of original communications describing the technic and results of experimental researches into the causation, diagnosis, and cure of disease in man. Papers on bacteriological, biochemical, pharmacological, physiological, serological, and other subjects are therefore published when bearing directly upon these subjects (Bimonthly, Lewis). *Archives of Pathology.* Published by the American Medical Association as a medium to advance pathology in the United States and to promote research and observations in this field (Monthly).

General Journals of Medicine and Science: Journal of the American Medical Association. Includes departments on Government Services; Foreign Letters; Medicolegal Abstracts; extensive abstracts of current medical literature (Weekly). *The Lancet.* A journal of British and foreign medicine, surgery, obstetrics, physiology, pathology, pharmacology, public health, and news (Founded 1823. Weekly). *Science* (American Association for the Advancement of Science, Washington, D. C., Weekly).

Public Health: American Journal of Public Health and the Nation's Health. Published by the American Public Health Association, New York. The reader can see for himself why this journal should be in a public health laboratory. It features a selected public health bibliography with annotations (Monthly). *Public Health Reports* U. S. Public Health Service (Weekly). *The Journal of Hygiene.* Founded in 1901 by G. H. F. Nuttall, F.R.S. The editorial board represents outstanding workers in preventive medicine, bacteriology, immunology, and epidemiology, and includes Dr. G. S. Wilson, Director of Public Health Laboratory Service, Medical Research Council. The last issue publishes parts 9 and 10 of a valuable series of articles on Feeding and Breeding of Laboratory Animals by investigators from the National Institute for Medical Research, London (Issued irregularly, Cambridge University Press).

Clinical Laboratory Investigation: Proceedings of the Society of Experimental Biology and Medicine (Society for Experimental Biology and Medicine, New York, Monthly). *Journal of Experimental Medicine.* Published by the Rockefeller Institute for Medical Research. Designed to cover the field of experimental medicine (Monthly, Williams & Wilkins). *Journal of Clinical Investigation.* Edited for the American Society for Clinical Investigation. For the publication of original investigations dealing with or bearing on the problems of disease in man (Monthly, Lancaster Press). *Medicine.* Analytical reviews of general medicine, neurology, psychiatry, dermatology, and pediatrics (Quarterly, Williams & Wilkins). *Archives of Internal Medicine.* Published by American Medical Association for the advancement of scientific medicine in the United States and for the reporting of research and observations in the domain of internal medicine (Monthly). The Scandinavian *Journal of Clinical and Laboratory Investigation.* Edited for the Scandinavian Society for Clinical Chemistry and Clinical Physiology. Publication began 1949. It publishes original articles closely associated with clinical research and based on laboratory investigations; and pure methodological work of importance for clinical research. The text is in English (Quarterly). *American Journal of Medical Sciences,* E. B. Krumbhaar, Editor. Valuable review articles and book reviews (Monthly, Owners and Publishers: Lea and Febiger). *Pediatrics.* The journal of the American Academy of Pediatrics, Inc. It includes a section of original articles; and special sections on The Pediatrician and The Public and Trends intended to be unbiased and factual, presenting both sides of controversial matters (Monthly, Thomas).

Clinical Pathology: American Journal of Clinical Pathology. Official publication of the American Society of Clinical Pathologists. Devoted to the prompt publication of original investigations and observations in clinical pathology and pathologic anatomy. It includes a Technical Section, bimonthly, which is reprinted separately as the *Technical Bulletin.* Selected abstracts (Monthly, Williams & Wilkins). *Journal of Laboratory and Clinical Medicine.* Official publication of the Central Society for Clinical Research. Manuscripts describing original observations in the broad fields of clinical investigation and clinical pathology are invited. Society affiliation will not prejudice or influence editorial decisions. Two sections: Clinical and Experimental; and Laboratory Methods (Monthly, Mosby). *Journal of Clinical Pathology.* Edited for the (British) Association of Clinical Pathologists. Publication began 1948, Editorial board includes the Editor of the *British Medical Journal,* published by the British Medical Association (Quarterly). It includes a section on Technical Methods; and abstracts published in collaboration with *Abstracts of World Medicine* and *Abstracts of World Surgery, Obstetrics and Gynecology.* Abstracts of some of the more important articles of interest to clinical pathologists are selected, and are classified under bacteriology; biochemistry; hematology; and morbid anatomy and histology. *Blood: The Journal of Hematology.* This journal was established in 1946 to make current hematologic material systematically available from one central source; and to provide in the western hemisphere a clearing house for the needs of a major professional group (Abstracts, Monthly, Grune and Stratton). *Stain Technology.* A journal of microtechnic. Official organ of Biological Stain Commission. The objects of this commission are to increase the reliability of biological stains on the market; and to stimulate research concerning stains and their biological uses. Manufacturers are urged to submit a sample of each batch of any stain for testing before marketing. If found satisfactory, it may then be sold under the Commission certification. Journal publishes excellent articles on new procedures (Quarterly, Biotech Publishers, Geneva, N. Y.).

Bacteriology, Parasitology, and Immunology: Journal of Immunology. Official journal of the American Association of Immunologists (Monthly, Williams & Wilkins). *Journal of Bacteriology.* Official organ of the Society of American Bacteriologists. Devoted to the advancement and dissemination of knowledge in regard to bacteria and other microörganisms. Its cover carries the quotation from Pasteur "It is characteristic of Science and Progress that they continually open new fields to our vision" (Monthly, Williams & Wilkins). *Bacteriological Reviews.* Published to provide authoritative, critical surveys on the current status of subjects and problems in the diverse fields of microbiology (Quarterly, Williams & Wilkins). *The Journal of General Microbiology.* Edited for the Society for General Microbiology. First published, 1947. The Society was founded to promote the advancement of microbiology by providing a common meeting ground for those working in all the various specialized fields, including, for example, medical, veterinary, agricultural and economic microbiology . . . its members being united by the common aim of developing scientific knowledge concerning microörganisms (Quarterly, Cambridge University Press). *American Journal of Syphilis, Gonorrhea, and Venereal Diseases.* Official journal of the American Venereal Disease Association. Abstracts of current literature (Bimonthly, Mosby). *Journal of Venereal Disease Information.* Abstracts of current literature. Abstracts are available on request of articles listed by title from foreign and other journals. In

addition, abstracts of articles concerned with venereal diseases or related subjects which have been published in the better known journals in the past twenty-five years are on file and open to workers in the field (Monthly; published by the Division of Venereal Disease, U. S. Public Health Service). *American Journal of Tropical Medicine.* Official organ of the American Society of Tropical Medicine. Authors completing original investigations in the geographical distribution, etiology, transmission, pathology, diagnosis, clinical manifestations, and therapy of diseases in the field of tropical medicine, are invited to submit papers for editorial consideration (Bimonthly, Williams & Wilkins). *The American Review of Tuberculosis.* Official journal of the American Trudeau Society, Medical Section of the National Tuberculosis Association. The Review invites manuscripts on any phase of tuberculosis, non-tuberculous pulmonary diseases, and related subjects. It consists of two main parts, (1) original articles and (2) abstracts. The original part is monthly; abstracts appear as the amount of material warrants. Each part paged separately to permit permanent separate binding (Monthly).

Sanitation: Journal of the American Water Works Association (Monthly). *Sewage and Industrial Wastes.* The journal of the Federation of Sewage Works Associations (Monthly). *Journal of Milk and Food Technology.* Official publication of International Association of Milk and Food Sanitarians and designated official organ of the Association of Milk and Food Inspectors and Sanitarians and Dairy Technology Societies (Bimonthly).

Abstract Journals: Bulletin of Hygiene, issued by the Bureau of Hygiene and Tropical Diseases, London. It contains abstracts of current medical literature on public health administration, social services, communicable diseases, sanitation, nutrition, occupational hygiene, bacteriology, and immunology, and related subjects of public health interests (Monthly). It is a superior journal of abstracts prepared by eminent contributors and covering a European and Commonwealth literature often not otherwise readily available. *Chemical Abstracts.* Published by the American Chemical Society. Key to the world's chemical literature (Semimonthly).

Chemistry: Journal of Biological Chemistry. Published for the American Society of Biological Chemists for the prompt publication of original investigations of a chemical nature in the biological sciences (Monthly, Williams & Wilkins).

The interest of the public health laboratory worker should encompass all of these fields, and he should be conversant with them. I wish I were among the few whose knowledge of all of them is intimate.

Highlights of the American Academy of Pediatrics Study and What They Mean for the Improvement of Child Health*

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FOR the past couple of years various aspects of the Study of Child Health Services have been presented at meetings of this Association. Heretofore the discussions have necessarily been fragmentary pending completion of the study. Now the findings for the country as a whole are published in two volumes and in more detail in separate reports for the individual states.

I trust that most, or at any rate many of you, are familiar with the overall summary report.[1] In this volume we did not attempt to include all of the accumulated data but rather to bring out the highlights with abundant use of charts and graphs. A second supplementary volume[2] which appeared only a couple of months ago, gives all of the basic data from which the first was composed and a great deal more that will be of particular interest to state and local health agencies.

The state reports[3] with which you are undoubtedly less familiar are not yet completed in all states. Up to the present date, 21 have been published; the rest are in varying stages of preparation. These state reports deserve a special word of comment for they arose from one of the unique features of this study—the fact that it was a survey, state by state, and county by county, for the whole country. We could have done a sample survey with techniques comparable to the National Health Survey of ten years ago. Had we done so, the national averages would have been as reliable—perhaps more reliable—and certainly much less costly. But then we could not have attained one of the most valuable results that have come out of this undertaking. The very act of calling upon health officials and practising physicians to look into services for children in their own community has done much to arouse local interest and pave the way for action designed to remedy the deficiencies which were revealed.

We may also look with gratification upon the team work which was established between governmental and nongovernmental interests. The partnership of the Public Health Service and the Children's Bureau and the American Academy of Pediatrics was reflected in similar coöperation between local pediatric groups and state health departments. In many states, the directors of maternal and child health worked with

* Presented at a Joint Session of the American School Health Association, and the Dental Health, Maternal and Child Health, Medical Care, and Public Health Nursing Sections of the American Public Health Association, at the Seventy-seventh Annual Meeting in New York, N. Y., October 28, 1949.

For Shaffer, Thomas E., presented at the same session, see *A.J.P.H.* Jan., 1950, pp. 63–66.

the state chairmen of the Academy to collect and to report the data.

Now, with the facts reported at national and state level, we are confronted with the question: "What to do about them?" The question brings us right back to the basic purpose for which all this fact finding was done. From the outset it was recognized that the survey was merely a tooling-up process, a method of obtaining the instrument with which to carve out a pattern for better health for *all* children.

It is a matter of no little significance that within one year of publication of the study report there should be a panel such as this, with representation from the private practice and public health aspect of pediatrics, and from the dental and nursing professions, all directed toward the common goal of filling existing gaps in child health services.

Perhaps the most important fact, and one with which we have long been familiar, is the clear relation between services and the training of those who are giving the services. In the last analysis, good medical care for children depends not so much on the physical facilities of hospitals or the expansion of health services as upon the judgment and skill of individual physicians, whether caring for children in private practice, conducting well baby clinics, or participating in a school health program.

We have shown that three-fourths of the private medical care of children is in the hands of general practitioners. A corollary of this fact is that one-third of the average day's work of the general practitioner is taken up in the care of children. Yet we have also seen how little opportunity the general practitioner has for training in the medical care of children. It is very clear therefore that one of the prerequisites in a program for the improvement of child health is more pediatric education for the general practitioner. Increased opportunity must be provided for more training in the medical care and health supervision of children during his medical undergraduate years, during his graduate training as hospital intern or resident, and thereafter through various methods of postgraduate training.

Toward this end, medical schools should take into account the large proportion of the practice of general practitioners which is concerned with children and assure all students adequate training in pediatrics. There is need for more opportunity for physicians training for general practice to have pediatric training in those hospitals which are approved for pediatric residency. State licensing boards would do well to look into the requirements for medical licensure with particular reference to the amount of hospital training in pediatrics which is required and the pediatric content of the examination.

Another of the findings highlighted by the Study is related to the remarkable change that has occurred in pediatric practice and the protection of child health during the past generation. Certain diseases, which accounted for a high proportion of deaths twenty or even ten years ago, have become less frequent or have largely disappeared, coincident with better control measures including specific preventive and therapeutic measures. From 1930 to 1945 deaths from diphtheria in children dropped from approximately 15 to 4 per 100,000. During the same period, scarlet fever and other streptococcal infections have shown a striking fall in mortality. In fact, scarlet fever when treated with modern methods has reached such a low mortality rate that it no longer constitutes a serious menace to life for children. General mortality rates for infants and children have shown a remarkable decline. Infant mortality has dropped from 76 deaths per 1,000 live births in 1921 to 32 in 1947. The death rate among preschool children has declined from

approximately 20 deaths per 1,000 population in 1900 to about 3 in 1920, and approximately 1 in 1945.

As childhood diseases have declined in frequency and severity, the physician has given more and more time to the protection of health and less to the care of the sick. Today, health supervision of the well child is the major part of the pediatrician's daily work. During the course of the study 54 per cent of the pediatrician's visits on an average day were for health supervision and 43 per cent for the care of sick children, the remaining 3 per cent being for persons of 15 years or older.

The general practitioner gives relatively less attention to health supervision. Presumably his time is in greater demand for the care of the sick. Thus, only 9 per cent of the general practitioner's visits to all patients are for health supervision of the well child. An additional 21 per cent of the general practitioner's daily visits are for sick children. Thus, about one-third of his practice may be considered of a pediatric nature, of which about one-third has to do with well child supervision.

Nevertheless it is the general practitioners who, because of their numbers, give most of the health supervision for the nation's children. In isolated areas health supervision in private practice is almost entirely carried out by general practitioners.

The training given to physicians, first in medical school and then in hospitals, is poorly adapted to prepare for work which is so largely concerned with health supervision. There is no question that increasing attention should be given to the preventive aspects and supervision of normal growth and development. All physicians should have opportunity to develop an understanding of normal new-born care, immunization procedures, mental hygiene, well child conferences, school health programs, and all other such community services which are organized to protect the health and well-being of a nation's children.

It should also be noted how much of the service in well child clinics and school health services is given by health officers, many of whom have had little if any special training in pediatrics. About one-fourth of all well child clinics are conducted by health officers; of all physicians serving in the schools, about 20 per cent were found to be health officers. In isolated counties there are even larger proportions of services rendered by health officers who include this duty in a daily schedule which is crowded with manifold and varied responsibilities such as environmental sanitation, communicable disease control, venereal disease, and tuberculosis clinics. Their knowledge of normal growth and development and of infant nutrition is frequently unsupported by clinical experience with disease. It is very evident that steps should be taken to provide adequate pediatric training for the medical personnel participating in programs for health supervision of children.

Another of the Study's highlights is inescapable. Children in outlying areas, far removed from the medical centers usually found in the metropolitan areas, do not receive the full benefits of modern medical care. Despite the remarkable advances made within the last generation, if we look within the averages there is little room for complacency. One state has an infant mortality exceeding the national average a generation ago; children in or near cities receive 50 per cent more care than those in isolated counties, more hospital care, more medical care, and more health supervision. There is a gap, and a serious one, between the newer knowledge of the medical center and its application to those living in places from which the medical center cannot be readily reached.

This discrepancy between the rural and urban care and the care in low-

income versus high-income groups is seen not only in private practice and hospital care but also follows the same pattern so far as public health activities are concerned. In other words, where services from practising physicians fail adequately to cover the need, there too a gap is found in the services of community health agencies.

There is no need in this discussion to dwell upon the tremendous expansion of state and local health services which have been stimulated by Children's Bureau grants. As reported by the Children's Bureau in 1947, 561,000 infants and preschool children attended well child clinics. Over 1,800,000 medical examinations of school children were given. Immunization for smallpox totalled more than 2,400,000 and for diphtheria 1,500,000. All states now provide a range of services under the Crippled Children's Program including case finding, diagnosis, and medical care. The states reported that more than 160,000 crippled children received service in 1947.

Despite all the increase that has occurred in the amount of such service given by both private and official health agencies, it is startling to note in the Study data that only 1.5 per cent of the total volume of child care is given by these agencies, all but this small fraction being accounted for by physicians, hospitals, and outpatient clinics. From this point of view the role of public health agencies is seen in a new light. If one looks only at the Children's Bureau's extensive nation-wide program, government assumes a very impressive position. If, however, these services are recognized as only a portion of the 1.5 per cent, the Bureau's position in the overall picture appears in a very different perspective.

For example, the fact that, during the Study year there were 160,000 well child conferences held would seem to add up to a reasonably adequate increment of service. However, viewed from a different angle, we find that only 6 per cent of the country's infants and preschool children received any services from well child conferences. There were 2,000 counties (two-thirds of all counties in the United States) where no well child conferences were held, and in them dwelt 31 per cent of all the children under 5 years of age. Add to this the further fact that, in relation to population, there were 4 times as many sessions and 10 times as many visits to well child conferences in large cities as there were in rural areas.

School health services by a physician hardly existed in over half the counties in the United States, in which were found 22 per cent of the school age children. A few more counties had some school nursing service but 11 per cent of the school age population had neither medical nor nursing school health services. It is therefore clear that health services for children share in the overall problems of distribution of medical care.

Thus, there are certain outstanding facts which emerge from the study and which indicate quite clearly the steps that may be taken on the road to better health for children. First and foremost, is the need for more pediatric training for all physicians — pediatricians, general practitioners, and health officers — a need which must be met before other health measures can be effected. Second, is the need to make available to outlying areas the same high quality of medical care which exists in and around medical centers. It is upon these basic problems that the attention of those concerned with the health problems of children must be focused.

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Better Training in the Care of The Well Child*

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AT the outset, I should like to limit my discussion to the training in well child care of house officers on pediatric and on rotating hospital services. This is not to overlook the great importance of the medical school curriculum or of postgraduate training in this field, but time does not permit such a broad discussion. Also, I should like to state the premise that the best situation for training a doctor in well child care is in the place which provides the best service to well children. I shall return to this premise later.

The recent nation-wide survey of Child Health Services [1] conducted jointly by the American Academy of Pediatrics, the U. S. Children's Bureau, and the U. S. Public Health Service indicates clearly that the content of medical practice is changing in the direction of more preventive work for the well patient. About one-third of the general practitioners' visits to children and more than one-half of the pediatricians' visits are to well children. We have no data regarding the amount of such preventive work in the private practice of 25 years ago, but pediatricians are agreed that such work presents a steadily increasing part of their practice.

It would seem reasonable to expect that this change in the content of medical practice would have been accompanied by a corresponding change in the content of the curriculum in medical schools and of the training of house officers, and that instead of putting all the emphasis on the ill child, as was usual 25 years ago, there would now be more consideration of the child's normal range of growth and development. However, this is not the situation.

At the present time training in the care of the well child is provided in four areas: in premature and new-born nurseries, in well child clinics, and in school health programs. The accompanying table shows that in 1947, approximately one-quarter of all pediatric house officers failed to get adequate training in the care of new-born infants—that is, in the problems which arise in the first month of life. Of greater concern is

Pediatric House Officers Not Receiving Training in Care of Well Children at Time of Survey

(Data from 843 Approved Residencies)

Type of Training	*Number*	*Per cent*
Premature Service (Under Pediatric Staff)	69	8
New-born Service (Under Pediatric Staff)	262	31
Well Child Clinics (10 or more hours per year)	492	58
School Health (10 or more hours per year)	807	96

Source: *Child Health Services and Pediatric Education*, New York, The Commonwealth Fund, 1949.

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the fact that over half of these interns and residents had no training during the year in well child clinics or school health programs which are the areas currently used to give training in the problems of the well child after the new-born period. We do not have comparable information about the training in well child care of rotating interns and general residents who will become the general practitioners of the future, but we do know that it is not as good in these respects as is the training of the pediatric intern. It is to be emphasized that any attempt to improve the care of the well child must be concerned with the general practitioner, because he is the one who provides medical service to the great majority of children in this country.

At this point it will be helpful for us to define what we mean by well child care. To do this, I have examined what we are doing in our own well child clinics at Hopkins, and what I formerly did in the private practice of pediatrics, and have listed these activities under 9 headings, as follows:

1. History (including records of height, weight, etc.)
2. Physical Examination
3. Regulation of Feeding
4. Immunizations
5. Laboratory
6. Anticipatory guidance
7. Advice in handling of behavior problems
8. Nursing follow-up
9. Consultation with or referral to private physician, nutritionist, medical-social worker, etc.

It is clear from this list of items that we have moved some distance from the physician of my youth who handled the troublesome matter of children with minor or insignificant complaints by giving them 2 tablespoons of castor oil. I remember being in his office in a fashionable boarding school and watching the face of a boy taking his prescription while the doctor said to me, "You will find that an occasional dose of castor oil is one of the best methods of keeping well children out of your office."

In regard to the problem of physical examination in well child clinics, our own current practice is to do two kinds of physical examinations: (1) complete examinations which are done at certain age levels; and (2) partial examinations which are done at each visit. Complete examinations are done on the initial visit, at 6 months, 12 months, 24 months, and 36 months; and of course the physician does additional complete physical examinations whenever he feels it is necessary.

The limited examinations are done on every visit. The child is stripped to allow rapid inspection for color, nutrition, skin turgor, and for any gross abnormality. Attention is then given to things which we have found important to observe as the months roll along. We try to emphasize a different thing each month. For example, we feel the sternocleidomastoid muscle of all newborns to look for the occasional one who develops a hematoma with resultant shortening and wry neck. About the 3rd month of age, we again examine the heart to detect any murmurs or other abnormalities which were not present at the initial examination. About the 5th month, we begin to watch the legs during that period when it is sometimes difficult to distinguish between the bowing which is physiological and that which is due to rickets. At the 7th month, we are concerned about retraction of the foreskin in boys. When the child first begins to walk we pay attention to his legs, feet, and gait, with a thought for the rare case of congenital dislocation of the hip. These are examples of the way in which we try to gear out limited examinations to the growth and development of the child.

The other items on the list are largely self-explanatory, until we come to anticipatory guidance. This is the term we use to describe our attempts to discuss

the child's behavior with parents in advance of the time when such behavior patterns may create real problems. We have selected about 20 of the most commonly occurring situations of early childhood and have listed them on our record form as suggested topics for discussion. For example, on the first visit we discuss the need for flexibility in the amount and time of feeding and explain this on the basis of the variation in appetite which is normal to all of us. We say that the breast-fed baby takes what he wants, and since no one knows the exact amount taken, no one is concerned. But the bottle-fed baby gets a prescription for a given number of ounces of formula to be divided equally in the prescribed number of bottles. We say that this does not mean that the baby should always take just that number of ounces, no more or no less. In this way we try to prepare the mother to allow her child some part in deciding how much he shall eat. In the same manner, on an early visit, we take up the problem of rivalry when there are older children in the family, and we say that a certain amount of surprise and jealousy are to be expected and are normal when the new baby arrives, and describe some of the manifestations which may develop. At a later age, we include one session where we discuss thumb-sucking and handling of the genitals and tell the mother that these are to be looked forward to in all children. These are examples of the anticipatory guidance which we carry on throughout childhood.

Full-blown behavior problems still take time, but they are becoming a less important part of a pediatrician's work as he becomes more effective in other aspects of well child care, and especially in anticipatory guidance. For example, 20 years ago, anorexia was an important subject in pediatric circles. I recall one of the prominent pediatricians of that time who said that anorexia and the treatment of feeding problems had built his house for him. Times have changed, and I am sure that most pediatricians now would feel that the development of a severe feeding problem in a baby who had been continuously under their supervision would reflect on their professional ability.

This outline of the content of well child care clearly suggests that to achieve success in this field there is need for continuity of contact between doctor and patient over a relatively long period of time. We must take account of this in our plans for training. Such things as ordinary feeding difficulties or temper tantrums may require several months for solution, and the doctor-in-training must see the same patient repeatedly over this time period if he is to get valuable experience.

Next, I should like to describe the sort of experience which many house officers get in the usual well child clinic. Our typical house officer is assigned to a 2 hour clinic, 2 afternoons a week. He is not freed from his hospital ward duties on those afternoons, but carries concurrent responsibility in both areas. He comes late to clinic, having had difficulty in getting a continuous infusion started in a patient on his ward service. A glance at the crowded waiting room tells him that the clinic load is heavy this afternoon, and that he will have 15 or more patients. The clinic does not operate on an appointment system, so he takes the top chart from a pile. He calls out the name, "Freddy Forgitan." A mother carrying a 7 month old baby arises and comes toward him; he has never seen them before, and may never see them again because some other doctor may pick up the chart on Freddy's next visit. He feels pushed for time as he looks at the chart and notes that Freddy has gained 1½ pounds in the past month, and he asks: "How is your young man?" The mother says, "He is doing fine, doctor, except that he handles

his private parts a good deal." She is worried because she has heard that masturbation may be bad for a child when he gets older, and she is also concerned about her 18 month old girl who has been having increased crying spells and temper tantrums for several months. The house officer does not know much about masturbation in infants, and there is no one in the clinic with whom he can discuss the problem even if there were time. But he does not think it is very important, and tells the mother so. He then increases the feeding, gives the baby an immunization, and asks, "Do you have any other problems?" The mother thinks of the older child, but realizes that the doctor is in a hurry to see other patients and says, "No, I guess we're doing all right. Thank you very much," and leaves.

Our intern picks the next chart off the top of the pile and calls out, "Harold Divisus." Another mother, with a 3 year old half-hidden behind her, starts forward. The child takes one look at the white-coated man and starts to shriek and pull in the other direction. A nurse and the mother literally drag the child into the examining room. It turns out that he has a fever of 102 and an infection of the right ear. Our doctor thinks, "Good! Here is something worth while," but a warning thought makes him glance again at the chart where he notes that the family physician is Dr. X. He refers the child to Dr. X for therapy and tells the mother to come back when Harold is well. So goes the afternoon. This sort of experience is not as exaggerated as it sounds; the great majority of well child clinics do not operate on an appointment system; they see too many patients in too short a time; and, by their very definition, they separate the care of the well child from the care of the ill.

We may sum up the matter to this point by saying that the content of medical practice has been changing due to popular demand for more preventive medical care, with the result that over 30 per cent of all visits made to children are to well children. At the same time, the content of training which the embryo physician gets in medical school and teaching hospital has not kept pace with this changing content of medical practice, but is still largely concerned with the problems of the ill patient. Efforts are being made to improve this situation all along the line. But our present concern is with graduate training, with the intern, assistant resident, and resident.

The Academy Study, as summarized in the table points out certain obvious action to improve the training of house officers in well child care. The organization of all new-born nurseries under adequate pediatric supervision is clearly indicated. This table minimizes the job to be done, for it deals only with hospitals having approved pediatric residencies. A much greater problem will be to provide adequate pediatric supervision of the nurseries in all the hospitals which are used for the training of rotating interns. One favorable aspect of this part of our problem is that the need is recognized and the way to accomplish the task is fairly obvious. We return here to our premise that the best area to provide service is also the best area for training. The premature and newborn nurseries meet these requirements, and the proper organization of all these nurseries as a training area for rotating and pediatric house staff will mean that most physicians who serve children will have had experience in the care of the new-born.

The provision of comparable experience in the handling of well children beyond the new-born period is more difficult to accomplish. The deficiencies of the average well child clinic as a place for training house officers have been described and will not be easily remedied. Let us illustrate this by considering what happens when a health officer agrees to coöperate with a teaching insti-

tution to develop one of his well child clinics so as to make it an adequate training area for house officers. What must be done? First, more space will be required. Each house officer will need a place to interview and examine. Second, an appointment system must be set up so that the same house officer sees the same patient over a period of months. Third, the patient load must be regulated. The experienced physician, working with known patients, should average 15 minutes per patient if he is to do effective work, particularly in the field of anticipatory guidance. The physician in training should allow nearly twice this time, to see the patient and to check his work with the supervising physician. Fourth, there must be a program of seminars, case presentation, and other formal instruction which should include basic work in epidemiology and biostatistics. Fifth, this will require more paid professional staff of teaching caliber. Sixth, the house officer must have no other responsibilities during his hours in clinic. It is clear that the addition of such a teaching load to the service clinic program will cost money and add to problems of organization and administration. This is not the place to discuss the apportionment of this burden between the health department and the educational institution.

What I have been talking about up to this point concerns the improvement of training in those areas which traditionally have been used for experience in the handling of well children, the new-born and premature nurseries, and the well child clinics. I have omitted all mention of school health programs because they have not yet become a training area of major significance. We come back again to our initial premise that the best area for training is also the best one for giving service. The opinion has already been stated that the premature and new-born nurseries meet this test. The remaining question is: Are well child clinics and school health programs the best method of giving well child care to all of our child population beyond the nursery age? An affirmative answer to this question has been given in many countries. Thus, in England, in the Netherlands, and in the Scandinavian countries, many more than half of all babies and children are served by well child clinics and much of the well child care for older children is centered in school health programs. In these countries the private practice of the doctor is largely concerned with ill children. The separation between the care of the well child and the ill child is common practice.

My own view is that the child will be best served if the same physician, or group of physicians, assumes responsibility for his care, both when he is well and when he is ill, provided only that such physician shall prepare himself to serve the well patient with the same enthusiasm and ability that in the past he has devoted to the sick. If this view is correct, then it follows that the best area in which to train physicians in the care of the well child is one which approximates the office and home practice of a physician or a group of physicians.

The method which is suggested here is for a teaching institution to assume responsibility for the office and home care of a group of indigent patients as a training area for house officers. This should be a coöperative undertaking between a teaching institution and a health department and should have active support from the medical profession as discussed later.

It would mean the setting up of a group practice unit with each house officer responsible for the office and home care of a small number of patients who would constitute his private practice. His work would be supervised by a teaching staff. Emphasis would be on the problems of the well person but responsibility would be continuous,

whether the patient was ill or well, just as it is in practice.

The year in a group practice program would include formal teaching just as do the hospital years. Such studies would include clinic presentation of case material, seminars in growth and development, and courses in epidemiology and biostatistics.

This type of training would supplement, not supersede, the training now provided in hospitals. For example, the medical graduate who planned to spend 3 years preparing himself in pediatrics would spend 1 year in hospital, 1 year in the teaching group practice program, and a final year in the hospital. Some abbreviation will be necessary for the rotating intern who will take a shorter period of graduate training.

Such a training program would be advantageous both to the public and to the medical profession. In the past physicians have had to obtain their experience with the problems of the well child after going into practice and without the aid of formal teaching. The difficulties of this method plus the pressures of a busy practice have led many physicians to avoid work with well children and thus indirectly to encourage the growth of public clinics for well child care. A program which will provide training in and stimulate enthusiasm for the care of well children should reverse this trend and foster continuous care of the child when well and when ill by one practitioner. The members of the practising profession are highly qualified to aid in developing the content of such a training program.

In thinking about this, I am helped by the following analogy from the history of medical training: Fifty years ago the ambitious medical graduate apprenticed himself to a successful practitioner. He saw patients with his preceptor physician in home and office, and inevitably learned much about the minor complaints and problems which make up such a large part of the general practitioner's work. The great advance which was made in medical education about the beginning of this century was the development of the teaching hospital, whereby the sick patient part of this apprenticeship was brought in under the roof of the teaching institution and the residency system came into full flower. Concurrent with this gain, there was a loss which has not been adequately recognized: I refer here to the experience which the apprentice-physician received when he went into the home and when he saw patients with minor problems and complaints. The physician who does this gets information about the family and emotional background and socio-economic problems which can be had in no other way. I would suggest that we may now have reached that stage in our medical training where we can hope to bring under the roof of the teaching institution that part of the apprenticeship program which was lost fifty years ago; that the time has now come to provide training in the care of ambulant patients, both when they are well and when they have such minor illnesses as will allow them to come to the office or to be seen at home.

A physician with the combination of hospital and group practice experience here outlined would have an excellent basic training for a career in private practice, in academic medicine or in public health.

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Public Health Nursing in Relation to Child Health Services*

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IN the section on Community Health Services of the American Academy of Pediatric Study, only the public health nurse who worked in a program of a general public health character, or who visited families with children was considered.† The nurse whose work was limited to supplying school nursing service was reported only under school health services. No consideration was given to agencies giving special services in tuberculosis, venereal disease or industrial hygiene, since they did not give general service to children.

In evaluating the public health nurse's contribution to community health services, four varieties of services were studied: assistance in well child conferences, home visits for health supervision, bedside nursing care, and school services.

The Study staff took as a standard of adequate nursing service one public health nurse to every 2,000 persons (or one nurse to 500 children). On this basis it was estimated that this country needs more than five times as many public health nurses as there are at present. However, the N.O.P.H.N. recommends that for a basic minimum local public health service for administrative purposes not less than one public health nurse is required for each 5,000 of the population. Where bedside nursing care of the sick at home is offered, additional public health nurses assisted by graduate nurses without public health nursing preparation and practical nurses or other auxiliary workers will be needed up to a ratio of one to 2,000.[1] This would not appear so unattainable as the Academy figure. Even though the ratio of one nurse to 5,000 persons has been achieved in some states, we shall not have sufficient nurses for home bedside nursing in every state for some time to come.

Although public health nursing is considered to be an essential part of any community health program, in 1946 the Academy Study showed that 1,065 of the 3,000 odd counties in the United States had no public health nursing service for children. This is disturbing, yet it follows a pattern that is revealed throughout the study, that of incompleteness or absence of medical, dental, and hospital facilities and personnel in isolated counties. The Study shows that for the country as a whole there was an average of 60 full-time public health nurses per 100,000 children for the metropolitan counties. In the non-metropolitan counties it would appear that

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† The Academy staff defined public health nursing as including "registered nurses working full time or part time for community health agencies, both official and voluntary that give general service to children. Excludes nurses giving special services such as (a) nurses working full time in schools, (b) nurses employed by agencies giving only industrial, tuberculosis, or venereal disease service, and (c) supervisors employed by State agencies." *Supplement to Child Health Services and Pediatric Education*, Glossary, p. v:ii, Commonwealth Fund, New York, 1949.

there were only 23 public health nurses to each 100,000 children.[2]

That was three years ago. There has been a gradual improvement since that time. Our most recent reports show that in the past three years, the total number of public health nurses has been increased by 2,701 graduate nurses. However, we still have, in 1949, 936 counties and 17 cities without any public health nursing.[3] We believe that the growth of public health nursing is occurring in areas already having nurses. This probably indicates that a numerical increase in public health nurses will not necessarily solve our problems of distributing nursing service so as to reach all children, wherever they live.

One of the tables[4] presented by this Study serves to focus attention on indices of public health nursing services to children. It shows (1) the number of public health nurses per 100,000 children; (2) the number of home nursing visits during one year per 1,000 children; (3) the per cent of counties giving three types of service, that is, assistance in well child conferences, home visits for health supervision, and school service; and (4) the per cent of counties giving four types of services—the three above mentioned services, plus bedside home nursing.

The wide variation in the amount of service available state by state as shown by this table, raises some questions: Were there reasons that made bedside home nursing of sick children and infants less needed in some states? Were there policies which determined the kinds of nursing service that received higher priorities? Were there sufficient numbers of all types of nurses employed to include bedside home nursing services?

Five states were able to show that all counties provided three types of service but in only 3 states were public health nurses providing all four types of services in all counties. The percentage ranged from 100 per cent of the counties in 3 states providing complete services, to none at all in 1 state.[5]

Even where the traditionally accepted services of limited character were available—that is, where assistance in well child conferences, home visits for health supervision, and school services were reported—great variations were found from state to state. Only 24 states reported that 50 per cent or more of their counties were served by nurses giving these three child health services. Should we ask ourselves whether or not a re-evaluation of priorities in public health nursing programs is necessary?

The Study also points out vividly in a graph that in about half of the states, children received relatively few nursing visits in their homes.[6] The 10 states with 300 or more home visits per 1,000 children were: Connecticut, Rhode Island, Massachusetts, New Hampshire, New York, New Jersey, Delaware, Michigan, Wisconsin, and Illinois. Metropolitan counties were able to report a rate of over three times as many home visits to children per year as the non-metropolitan counties—338 as contrasted with 95 home visits for each 1,000 children per year.

It may be argued that the indices chosen by the Academy Study staff do not provide a true picture of the types and amount of public health nursing provided for children or that they do not indicate the relative value of one kind of service over another. The findings do, however, raise doubts as to the wisdom of relying on a quantitative measure alone. Too long have administrators and nursing supervisors been satisfied with a pleasing increase in the number of children who receive public health nursing services. It has been repeatedly pointed out that it is not the number of home visits made that is of primary concern, but what is accomplished on those home visits. It is high time that we give much thought to an evaluation

of public health nursing that is based on a wiser selection of children for home visiting and the record of what is achieved. Then we would be surer of what we are accomplishing.

We are constantly hearing that we must wait for more staff and money before we can undertake certain improvements. I wonder if that is always true. For a few minutes let us consider what we might do, without waiting for more personnel and funds, in order to increase the effectiveness of community nursing services. I have in mind home visits to children for health supervision. This is one activity in which the public health nurse may make a unique contribution.

First, the following questions need to be answered: Is it administratively possible for the public health nurse to allot a reasonable and regular proportion of her time to home visits? Are sufficient funds for travel budgeted or is transportation planned so that she can reach these homes? Is there provision for adequate and continuous nursing supervision so that the field nurse may better select the children and infants who will profit most from this home visit? Can routine home visits be reduced and more time given to selection of families for this service? Can the nursing interview at the well child conference contribute to the decision as to whether a home visit is essential?

Recognizing that we must provide an effective administrative framework in which a nurse can work, it is also essential that we provide the nurse with the right kind and amount of medical and nursing advice and assistance in carrying out her day by day job. These questions have occurred to me as pertinent: Can the nurse better utilize the time and service of special consultants in medicine, nutrition, mental hygiene, health education, and social work? For some nurses, group discussion, centered about case conferences, which illustrate ways of working with other professional workers, may be productive. For other nurses some help in a demonstration of the often ignored technique of "how to listen" might be a way to create and maintain relationships which would help her to accomplish more effective results in her home visits. More frequently than not, a nurse's report of a home visit for child health supervision is limited to "advised immunizations, adequate diet, and personal hygiene." If that is all she records, perhaps she needs only a rubber stamp. What would really be of value for the clinician at the child health conference is to learn if this mother and child react differently from one another in or away from home; if this child and his mother understand what to expect when they visit the doctor's office or the well child conference; if the nurse can discover some reason which would explain why the child does not eat the food recommended by the doctor. The changing of attitudes and feelings is a slow process. Frequently the public health nurse may have "missed the boat" entirely because she was not aware of individual differences in a child's growth and development, or she herself did not have security in her own ability and skill. We might go on with more examples, but I believe the ones I have given illustrate what I mean.

Many public health nurses have already incorporated the new and broad approach to child care and family relationships. The impact of other professional disciplines is greatly influencing her attitudes and relationships. Of course, the public health nurse is not alone in needing to change her approach to child care and family relationships. If we are to think of the total child, then doctors, educators, social workers, nutritionists, and others must commit themselves to the same principles.

As I said before, we can at least improve the quality of public health nursing for children, although for some time

to come we may not be able to solve the problem of the distribution of the limited but growing number of public health nurses in the United States.

The more complex implications of the distribution and the raising of qualifications of public health nurses who are giving child health services could well be the subject of much discussion. It is reasonable to suppose that, as the profession of nursing puts its own house in order and more nearly adjusts the supply and demand for public health nurses, more expert nursing care will be available. The need for better preparation of personnel for community nursing services will be met in part when more nurses are graduated from schools of nursing where all nurses are prepared for first level staff positions.

The Academy Study shows that only one-third of the public health nurses in the United States met the standard of completing one academic year in an approved program for public health nursing. Our most recent report [7] also shows about the same proportion. Miss Heisler goes on to report that in 23 of the states and territories the percentage of qualified public health nurses exceeds the general average and ranges upward from nearly 37 per cent to 86.2 per cent. Fourteen states have reached their all time high in 1949.[8]

We cannot leave this whole subject of Community Health Services without some consideration of what we as nurses can do about the problems revealed and the questions raised in the Academy Study. First, in addition to reading the nation-wide report, we should study our own state Academy report. These reports are informative and readable. We may agree with what is said or we may wish to take issue with the facts and their interpretation. Many of the facts highlighted are not new to the public health nurse, but it is important to make use of the recommendations in the state reports. These state reports point out in a variety of ways that more public health nurses are needed.

Certainly further study and additional research will reveal many problems that will require the coöperation of a team of professions to solve. Public health nurses are ready and eager to participate in analyzing needs and providing better care for children in their communities.

We public health nurses may turn to a number of state and national organizations for specific help in getting started with a program of action. The National League of Nursing Education has long promoted a National Committee on the Education of Nurses in the Care of the Child. This committee has local or state committees in only a very few states at present. These need to be increased. Recently, in keeping with the publication of the Academy report, the National Committee changed its name to Nursing in Child Health Services.

Inservice educational programs, centered around the care of mother and child have enriched the background of the nurse. They have increased her understanding of the child by utilizing pediatricians, medical-social workers, nutritionists, and experts in mental hygiene, child growth and development. On the national level, many voluntary and official agencies provide a wide variety of consultation by experts in special fields of interest, such as orthopedic nursing, school health services, and mental health. The N.O.P.H.N. Section on School Nursing and the Public Health Nursing Section of the A.P.H.A. are also possible resources which can serve to focus the interest of public health nurses in the field of child health.

For some time the Children's Bureau has been particularly interested in the stimulation and development of advanced programs of study in pediatric nursing. Funds have been granted through state health departments for

the development of more educational centers, strategically located in regions, in order that consultants, teachers, and clinical nursing experts could be filling the gaps in the great demand for more highly qualified nursing personnel both in the fields of public health nursing and nursing education. In many states, provision is made for the granting of stipends and fellowships through the allocation of training funds by maternal and child health divisions in state health departments.

But all of this will not be enough to help nursing meet its obligations in pulling its share of the load. Something else must be added, even though we find more money and people to do our job better. This I should like to think of in terms of a renewed zeal on the part of each of us.

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Summer Course in Food Technology

The Massachusetts Institute of Technology announces a special intensive program in food technology, June 12–30, 1950. Various phases of food handling, processing, and storage will be covered including such specialized fields as high vacuum drying, juice concentrates, and food chemistry and nutrition by the use of "tracer" elements. Academic credit will be given for satisfactory completion of the work. Enrollment is limited and preference will be given to those having a background of technical or executive experience in food industries, faculty members of other schools, government workers in food or nutrition, and advanced chemistry or engineering students. Tuition, $100. Details and application blanks from Professor Walter H. Gale, Room 3-107, Massachusetts Institute of Technology, Cambridge 39.

Dental Care for Children*

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EVIDENCE has been available for a long time that a marked disparity exists between dental needs and dental services,[1] and that young children get very little dental care.[2]

The question as to why these conditions exist has occupied the attention of public health dentists for many years.

This much we are sure of: good dental health for children depends on the quality and availability of dental services. Viewed from any angle — the prevention of dental diseases, the caring for the yearly increment of defects which appear in the teeth, the interception of threats to normal growth and function, the correction of dental anomalies — children must have good dental services frequently and periodically.

It follows then that one of the prime requisites of good dental health for children is well trained dentists who are readily available. The distribution of dentists has been studied by several investigators[3-5] and the effects of community, county, and state economic status on this distribution noted.[6-8] This information suggests that while no community is overburdened with dentists, some places are more favored than others, largely on an economic basis. Dentists tend to practise in areas of high income; not necessarily in areas of greatest need. As a result, wide variations exist in the availability of dental service.

The American Academy of Pediatrics Study of Child Health Services not only documents these findings but gives them perspective on a county, regional, and national plane. In these reports[9] are masses of data showing the great differences in availability of services, the maldistribution of dentists, and the plight of the low-income areas. The rate of visits to the dentist per 1,000 children becomes smaller as the study moves from metropolitan counties to isolated rural counties. The rate also becomes less as it moves from high per capita income regions to low ones. The number of dentists per 1,000 children follows this same pattern exactly.

We must therefore conclude that the problems inherent in the provision of good dental health services for children are nation-wide.

The Academy's attempt to examine all of the dental health resources of an area turned up some interesting information. It reveals that each year 1 out of every 50 children gets dental care in a clinic. It also clearly shows that clinics are unevenly distributed. For the most part they are located in large metropolitan counties. Some states offer virtually no dental clinic service for children. In fact, the pattern of dental clinic distribution duplicates that of the dentists; fewer in isolated counties; fewer in low per capita income states. These findings also confirm a smaller study.[10]

* Presented at a Joint Session of the American School Health Association, and the Dental Health, Maternal and Child Health, Medical Care, and Public Health Nursing Sections of the American Public Health Association, at the Seventy-seventh Annual Meeting in New York, N. Y., October 28, 1949.

The Academy study further shows that quantity and quality are by no means synonymous. Wide variations exist in the proportion of children examined to those treated, the number of visits and services per patient, and the ratio of fillings to extractions. Apparently many clinics are inclined to spread their efforts over as many children as possible, even though the service is meager. Of the 10 states reported as being above the average for the country in hours of dental care, only 3 are above the average in number of services per patient and the ratio of fillings to extractions. Four operating programs disclosed that more teeth were being extracted than filled.

One of the striking points revealed in this study is the fact that, on an average day, 96 per cent of the children receiving dental care did so in private dental offices. Furthermore, 92 per cent of this care was furnished by general practitioners.* From these facts we conclude that dentists in private practice are the principal sources of dental care available to a community population. By inference, any program which effectively improves the quality and quantity of dental care for children will have to be geared to the abilities and characteristics of the private practitioner. This being so, the secton of the Academy's survey concerning the private practitioner assumes tremendous importance.

Although the pertinent data relating to office practice were not reported from 2 states, it is possible to make some generalizations about the average American dentist. He is likely to be 47 years old and living in a metropolitan county. He engages in the general practice of dentistry and spends about 40 hours per week in private practice. The chances are that he does nothing further in a professional way, since only 5 per cent of the dentists reported any service in a preschool or school dental program, and but 1 out of 10 gave any time to other dental activities. He accepts children in his practice routinely, although 76 per cent of his patients are 15 years of age or older. Less than one-fourth (22 per cent) of his child patients are under 6. Eighty-five per cent of his services to children consist of fillings and extractions; three times as many of the former as the latter. It is highly improbable that he has had any special training in pedodontics. Only 9 per cent of the dentists reported postgraduate work in dentistry for children. Even in this case the chances are only 2 to 1 that the training period lasted as long as a month. He probably employs some sort of an assistant to help him conduct his practice, although 26 per cent of his professional brothers practise single-handedly. The chances that he employs a dental hygienist are very small.

This gives us a rough sketch of the man who provides most of the dental service for the children of the country. Upon him will fall the brunt of any plan to extend and improve the dental health of children.

Let us consider this picture further. The dentists reported that 24 per cent of their patients were under 15 years of age. At the time the Academy Study data were collected, children of these ages made up 26 per cent of the total population. Therefore, the number of children receiving service seems equitable. After all, adults have tremendous dental needs also. However, the data show that children received but 20 per cent of the available dental hours. A case might be made here that 20 per cent does not constitute a just share of office time, even though, as generally conceded, adult dentistry is more complicated and therefore more time consuming. Actually in a "saturated" practice, one in which all available time is filled, if a child is moved in, some

* Data on type of specialty from 18 states only.

adult must be moved out. Under such conditions, unless we advocate a "rob Peter to pay Paul" program, we can expect no great increase in the number of children receiving care. Certainly, the chances of increasing the number of hours of service are remote. The trend for shorter work weeks, rather than longer ones, is apparent everywhere. Dentistry is no exception. Furthermore, the rapid advances made in the knowledge of the dental sciences require that much more time be spent in study and reflection, a habit that the average dentist finds difficult even under present office conditions.

Although increased number of hours seems doubtful, the more efficient use of existing office time has promising possibilities. Some years ago Klein [11] disclosed that "the use of a dental assistant definitely increases the patient-load capacity of the average dentist." In fact, his study suggested that a dentist who could both employ an assistant and secure a second operating chair could treat 25 additional patients a week. Judging from personal experience, it seems that multiple equipment and well trained assistants are not only useful in increasing the quantity of dentistry for children, but the quality as well. However, the Pediatric Study reports that 26 per cent of the practising dentists use no assistants at all, and only 15 per cent use more than one helper. Even more disturbing is the report that only 7 per cent of the dentists are employing a dental hygienist. Yet, the topical application of sodium fluorides, the most promising dental preventive yet developed, lies well within her province.

The Academy report of the ratio of fillings to extractions and the fact that these two items constitute the bulk of the services is cause for concern. Evidence from other sources,[12] although spotty, suggests that the average tooth decay attack rate among elementary school children is about 4 per child. Three fillings and one extraction would not seem to give children full protective value: particularly since the prime aim of public health dentistry has been to reduce the lost-tooth index to zero. Besides, there are other dental services necessary to the development of healthy children [13] such as gum treatments and preventive orthodontics which apparently get little attention.

How closely the meagerness of the service can be accounted for by the lack of training in pedodontics is a matter of speculation. A dentist 47 years old probably received very little instruction in scientific pedodontics as an undergraduate. At least, the school catalogues of 20 years ago rarely mention such courses. Even today a heavy emphasis on dentistry for children is lacking in many schools. Only 9 per cent of the dentists reported any postgraduate work in pedodontics, and only a tenth embraced any outside dental activities at all. Therefore, it seems possible that much of the development in dentistry for children (a fairly recent growth) is not at the fingertips of the average dental practitioner.

The dominant and persistent fact suggested by the Pediatric Study of child dental services is the need for training, both as to improving the services of the practising dentist, and to getting more graduate dentists into the field. Even the paramount problem of reducing the incidence of dental disease is at issue, in the sense that much preventive technic is not widely applied. Basic to improvement in dental health services for children is the dental man power problem — how to increase its numbers and how to improve its distribution.

The Academy's Study points out several facts that are important to a consideration of this man power problem.

1. Sixty-six thousand dentists were found in private practice. No truly accurate count of the total number of

dentists in the United States is available, but various estimates would suggest somewhere between 75 and 78 thousand. Since 66 thousand dentists are in private practice, it is probable that some 10 thousand dentists would make up the pool of full-time teachers, research men, and clinicians. Obviously, the great majority of dentists prefer private practice, and it is doubtful that staffing a dental clinic with full-time dentists can be done on a very wide or effective scale. In the study there was some indication that dentists do participate in clinic programs on a part-time basis. The time given was very small but conceivably this could be increased. How much, is open to question. In the past, dentistry has been uninterested in internships. Now, there seems to be a trend by new graduates in dentistry to seek a year of graduate training before entering private practice. One state now makes it a requirement for licensure. A great difficulty is that few places are available for such training. Several large voluntary clinics and a few state agencies have used dental internes in their programs. For the most part, such internships have not had wide appeal for new graduates in dentistry, mainly because the theme has been on service rather than training. Community dental clinics might well consider the internship idea. At present it may be the only way to assure an adequate staff. To be popular, however, such programs must show their training value as a preparation for private practice.

2. The distribution of dentists according to dental needs seems impossible so far as private practice is concerned. Some state health departments are supplying dental services to isolated and rural areas by employing personnel and detailing them to the various places in need. Mobile dental trailers and portable operating units have been developed for this purpose. Although these programs have been operating for some time, they are still on a small and inadequate scale. Here again, the answer seems to be an internship program if adequate service is to be made available.

3. Efficient utilization of dental man power demands a much greater number of auxiliary workers. Many thoughtful dentists believe that their profession has no more than scratched the surface of its own potential as a health service. The almost universal need for dental care, however, effectively ties dentistry down. If lesser trained people could be taught to perform routine operations satisfactorily, dentists might then be freed to expand their fields of usefulness. This possibility is a subject of much discussion at the present time. Certainly the prospect of increasing the number of dental students materially is fraught with difficulties. Such an increase may not be wise. Overtaxing the dental schools could easily lead to lowered standards and inferior products. Auxiliary workers, under the direct supervision of highly trained dentists, would seem more feasible. Of course, this type of approach would require training facilities also, but conceivably of a less complicated and therefore less expensive kind. It should be pointed out, too, that not only should assistants be trained for their duties, but dentists must be trained in how best to use them. The latter is just as important as the former.

4. The fact that few dentists have taken postgraduate work or concerned themselves with other dental activities is food for thought. It is generally believed that dentists, by and large, are apt to practise all their professional lives the way they were taught in the undergraduate school. The facts in the Academy Study would suggest that basic dental education is quite likely to be terminal education. Presumably then, if dentists need training in pedodontics and the utilization of auxiliary aids, this training must be a part of their undergraduate curriculum.

All in all, it looks as if the big job with the most promise of ultimate success lies in the basic training of the dental student. It seems that the greatest strides toward better and more abundant dental care for children will be accomplished in that area.

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Lemuel Shattuck Award

Creation of a special award to be given annually in recognition of "distinguished" service by a New Englander in the broad field of public health was announced recently by Mary E. Spencer, Ph.D., president of the Massachusetts Public Health Association. The recognition, which will consist of a citation, will be called the "Lemuel Shattuck Award." The first award will be presented at the 60th Anniversary meeting of the Association to be held at Boston University on April 25, 1950.

Members of the Shattuck Award Committee who will name this year's recipient are: Dr. Hugh R. Leavell, professor of public health practice, Harvard School of Public Health, chairman; Dr. Alfred L. Frechette, newly appointed director of the Health, Hospitals and Medical Care Division, United Community Services; Dr. Elda Robb, director of School of Home Economics, Simmons College; Murray P. Horwood, Ph.D., professor of sanitary science, Massachusetts Institute of Technology; and Sophie Nelson, R.N., director of nursing, John Hancock Life Insurance Company.

Retrolental Fibroplasia*

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IN recent years ophthalmologists have become alarmed by an apparently new disease, retrolental fibroplasia, that has become one of the chief causes of blindness in preschool children. Because of the increased incidence of retrolental fibroplasia and the severe loss of vision it produces, this has also become a pressing problem to obstetricians and pediatricians, and particularly to those interested in public health. The disease produces extensive, destructive lesions in the eye which almost completely disrupt the normal structures and produce blindness. In the fully developed case of retrolental fibroplasia, a vascularized grayish membrane forms behind the lens of each eye. The growth of the entire eye is arrested. The cornea remains small and the anterior chamber very shallow. Usually, adhesions develop posteriorly between the iris and lens, and anteriorly between the iris and cornea. As a rule elongated ciliary processes can be seen in the far periphery of the pupillary space in front of the grayish retrolental tissue. Occasionally the intraocular tension increases, giving rise to a secondary glaucoma that produces further destruction of vision.[1]

The incidence of the disease, retrolental fibrosplasia, has increased markedly since 1940. Apparently this cannot be accounted for entirely on an increased survival of premature infants. The incidence of the disease varies somewhat in different localities.[2] The most significant fact known about retrolental fibroplasia is its association with prematurity. It rarely, if ever, develops in an infant born at full term. The incidence of the disease increases sharply as the birth weight decreases. It seldom occurs in an infant whose birth weight is between 4 and 5½ lb. The average incidence (computed from our own figures and those reported by Kinsey) is about 8 per cent in babies whose birth weight is between 3 and 4 lb. The incidence is twice as great, about 16 per cent, in infants whose birth weight is less than 3 lb.

In a recent publication Dunham [3] has estimated that about 150,000 premature infants are born in the United States each year.

According to the reported fatality rates, approximately 4 per cent or 6,000 of these weigh less than 1,000 gm. at birth, and about 15 per cent or 900 may be expected to survive. Approximately 7 per cent or 10,500 of the total number of premature babies born weigh between 1,000 and 1,500 gm., and of these 60 per cent or 6,300 may be expected to survive.

If 16 per cent of the surviving infants in the first group, and only 8 per cent of the surviving infants in the second group develop retrolental fibroplasia, approximately 650 cases of retrolental fibroplasia are to be expected in this country each year. This estimated number may be somewhat higher than the true figure, since the only available re-

* Presented before the Maternal and Child Health Section of the American Public Health Association at the Seventy-seventh Annual Meeting in New York, N. Y., October 26, 1949.

ports of survival are those from large hospitals where excellent facilities are available for premature care. Even if this figure is somewhat high, if the incidence continues, the increasing number of blind children will soon constitute a major public health problem.

Retrolental fibroplasia was first brought to public attention by Terry[4] of Boston who described the appearance of the disease in its late stages. Reese and Payne[5] in New York and Krause[6] in Chicago later described cases they had observed in the end stages of the disease.

In the earlier literature, there was considerable difference of opinion as to the nature and origin of the membrane behind the lens which seemed to be the main factor in the disease. Terry thought the abnormal membrane arose from a persistence of the embryonic blood vessels which nourish the lens in the growing fetus, the tunica vasculosa lentis. Reese and Payne extended this idea by suggesting that the retrolental membrane arose from the abnormal persistence and hyperplasia of the first embryonic vitreous formed in the development of the fetal eye, the primary vitreous. Krause thought the defect arose from a generalized maldevelopment of both the cerebral and ocular neuroectoderm occurring during the early stages of fetal life.

Krause, and Reese and Payne thought the disease was present at birth, differing from Terry who believed the disease developed after birth from the abnormal persistence of the embryonic blood vessels to the lens.

The main reason for this difference in opinion as to the nature of the disease arose because the earlier reports had been limited almost entirely to clinical and pathological examinations made when the disease was far advanced. No observations had been made on the course of the disease. No one had seen where the disease started, when it first began, the structures primarily involved, or how the disease progressed.

When we first became interested in retrolental fibroplasia it seemed obvious that the first step to be taken was to observe the onset and course of the disease in an attempt to settle some of the confusing questions that had been raised by the earlier reports. To find out when the disease starts, the structures primarily affected, and how the disease progresses, it was necessary to make observations on prematurely born children shortly after birth, and to continue the observations periodically until the disease reached the end stages described by the previous investigators. In July, 1945, we began to examine the eyes of all premature infants with birth weights of 2,000 gm. or less admitted to The Johns Hopkins Hospital. The eyes of each infant were examined at weekly intervals from birth.

Since the beginning of our observations on premature infants, we have repeatedly observed the onset and course of retrolental fibroplasia. We found that the disease occurs in about 15 per cent of the infants with birth weights of 1,360 gm. (3 lb.) or less. The disease is not present at birth as some of the earlier writers on the subject had postulated. No differences can be found on early examination between the eyes that subsequently develop retrolental fibroplasia and those that do not. In the cases that subsequently develop retrolental fibroplasia early observations show the size of the eye, the cornea, the anterior chamber, the iris, and the lens to be entirely normal. No abnormalities are found by ophthalmoscopic examination of the fundus. These observations show that the disease is not related to a persistence of the hyaloid artery or primary vitreous, as had been previously reported.

The first changes of the disease occur when the babies are approximately 4 weeks old. The earliest abnormalities

are seen in the retina and retinal blood vessels. The retinal veins become greatly dilated and the retinal arteries unusually tortuous. This is followed by a localized or generalized swelling and infiltration of the retina, which often becomes so extensive that the course of the retinal vessels cannot be followed in the areas of greatest retinal edema. The vitreous usually becomes cloudy. Localized bands arise from areas of proliferative retinitis and extend into the vitreous. This is followed by extensive retinal detachment and the formation of a complete retrolental membrane by the fusion of the vitreous bands and peripheral folds of detached retina. In these eyes all vision and usually light perception is soon lost. The complete retrolental membrane is usually formed by the time the baby is 4 months old.

Occasionally the disease becomes arrested at the stage in which only a partial membrane had formed behind the lens. In these eyes bands resembling retinal folds extend through the vitreous to localized areas of retinal detachment. Partial vision is usually retained in these eyes and some infants with this less severe involvement of the retina see well enough to walk about alone and play with toys.

In premature infants both eyes are usually affected by the disease, but often to various degrees. The membrane may be complete in one eye and only partial in the other.

From these observations it is apparent that retrolental fibroplasia occurring in premature infants is not due to an arrest in growth or aberration of some embryonic or fetal structure. The retrolental membrane is formed by a transformation of the retina itself which occurs in postnatal life. Operations to remove the retrolental membrane have been unsuccessful, for a portion of the retina itself is excised in the attempt to clear the retrolental space. No treatment has yet been found which is of any value when the disease is well established.

The cause of retrolental fibroplasia is still unknown. Our observations, which show that the disease occurs in the retina and begins in postnatal life, have redirected the thinking as to the possible etiological factors. Formerly, emphasis was placed on factors which might have been effective in the prenatal life of the infant.[7] It is now evident that the most fruitful investigation is to be found in a study of the postnatal course of the infant. At the present time we are investigating alterations in the metabolism of the premature infant which might be related to the occurrence of retrolental fibroplasia.

The premature infant is physiologically immature and the close correlation between the incidence of retrolental fibroplasia and the birth weight of the infant adds support to the theory that a metabolic abnormality is the cause of the disease. Added support for this theory is given by the observation that the first changes observed in the disease occur when the baby is about one month old. At this time the storage of essential metabolites may be depleted, and the infant, because of its physiological immaturity, may be unable to meet its nutritional requirements from the diet supplied.

The premature infant usually has difficulty in absorbing fat, so half-skim milk mixtures are frequently used for the feedings. Because of the low fat content of such a diet, possible deficiencies of the fat soluble vitamins, A, D, K, are usually prevented by adequate and often excessive supplements of these vitamins. Kinsey and Zacharias[2] found a correlation between the incidence of retrolental fibroplasia and the use of vitamin supplements in water-miscible form and the increased use of iron.

Of the fat soluble vitamins, vitamin E alone has usually not been added to the diets. Vitamin E, functioning as an

anti-oxidant, plays an important role in protecting or stabilizing unsaturated fats especially during their mobilization, metabolic turnover and storage in tissue cells.[8] In animal nutrition vitamin E is particularly important for the normal development of the immature organism.[9] In our present investigations we are supplementing the diets of the smaller premature infants at The Johns Hopkins Hospital with a special water-miscible preparation of d-1 alpha tocopheryl acetate, a form of vitamin E. These supplements are started in the first week after birth. So far the results in the prophylaxis of retrolental fibroplasia with d-1 alpha tocopheryl acetate have been very encouraging.

It seems certain that metabolic studies on the postnatal course of the premature infant will provide the solution to the etiology of retrolental fibroplasia.

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Safe Handling of Radioactive Isotopes

Recommendations for the safe handling of artificially produced radioactive isotopes in the typical laboratory or small industrial operation are concisely set forth in a new handbook issued by the National Bureau of Standards. Prepared by the National Committee on Radiation Protection, help was obtained also from members of the medical organizations of the United States, radiation equipment companies, and other government departments including the Public Health Service, Atomic Energy Commission, and the Military Services.

Handbook H42, *Safe Handling of Radioactive Isotopes,* 29 pp. 15 cents. Superintendent of Documents, U. S. Government Ptg. Office, Washington 25, D. C.

Advancing Frontiers in Insect Vector Control*

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INSECT control designed to prevent human disease has been carried on for only half a century—but this short epoch is characterized by an almost incredible range of technical, administrative, and organizational developments. It is regrettable that only a few of those believed to be important in advancing insect control as a public health practice can be mentioned.

The transfer of disease by insects† was first demonstrated in 1893 when Smith and Kilborne showed that Texas cattle fever was spread by ticks.[1] Within twenty years it was found that some of the more important diseases of man—malaria, yellow fever, plague, typhus, and many others—were carried by insects. These discoveries provided the epidemiologic basis for a new but important principle in environmental sanitation, namely, communicable disease control by preventing contact between man and insect vectors of infection.

By the turn of the century, the life cycles of certain disease-transmitting insects — mosquitoes, house flies, fleas, and lice—were known. This information was essential in developing effective control principles and practices. Those available at the time included drainage and filling for the destruction of mosquito breeding places; the use of larvivorous fish; larviciding with petroleum oils; killing or repelling insects with smudges, fumigants, and heat; and excluding them from buildings and sleeping areas by means of wire or cloth screening.

Insect vector control has come a long way since then. Paris green[2] reduced the costs of anopheline larviciding and made possible the use of highly mechanized as well as manual methods of application. Pyrethrum, a traditional component of insect-killing powders, was elevated to new heights of effectiveness by extracting its insecticidal principles and using them in space sprays and aerosols.[3-5]

From the standpoint of insect control technology, World War II was a huge success! The wartime pressure on insect toxicologists to find better insecticides liberated DDT from the oblivion of potato beetle killing, to fulfil its glorious destiny as a mass executioner of lice, fleas, mosquitoes, and the various flies which spread disease. Army operations, especially in the tropics, provided unparalleled opportunities to use this compound against malaria, epidemic typhus, plague, dysentery, dengue, filariasis, and sand-fly fever. In all instances the superiority of DDT over insecticides previously available was affirmed. Tens of thousands of disease casualties and many deaths must have been prevented by its use without apparent injury to

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† The word "insects" is used throughout this presentation in its popular understanding to include ticks and mites as well as true insects.

the millions of persons exposed to it.*

DDT, however, is much more important as a symbol of progress in insect control technology than as dichlorodiphenyl-trichloroethane. It is the first chemical known which retains its ability to kill or repel adult insects by contact for months after its application. Applied within homes, it prolongs the ephemeral effects of space sprays in reducing the number of insects most likely to transmit disease. Thus, it has established new levels of effectiveness and economy in preventing infections spread by insects which invade houses to feed upon man or to contaminate his food.

In spite of its unprecedented successes, DDT is by no means a flawless insecticide. On the basis of animal experimentation, it is assumed to have cumulative toxic propensities for man.[10] It now appears unable to uphold its early reputation as a house fly killer because of the extraordinary resistance of survivor strains which have developed in time wherever DDT has been used.[11]

* It is interesting to reflect that, but for the war, we might have known little or nothing about DDT as a public health insecticide. When its remarkable insect-killing and residual properties became apparent, the compound was subjected to routine toxicologic scrutiny and passed as being safe for insecticidal purposes.[6] Time did not permit an assessment of its hazard as an accumulative poison, and military considerations justified some calculated risk in its use. Since then, millions and millions of pounds have been dusted and sprayed inside and outside of houses and animal shelters in many lands. No significant damage to man—when DDT was used prescriptively—has been reported thus far. Sounds of alarm, however, have been issuing recently from the toxicologists who produce evidence that DDT accumulates to dangerous levels in the fatty tissues of experimental animals exposed repeatedly to this compound[7]—and it is reasonably assumed that the same phenomenon may occur in man. It has been found, furthermore, that DDT appears in the milk of dairy animals if used on their feed, in mangers or water containers, or on the animals themselves for insecticidal purposes.[8] As cow's milk is the principal food of many infants and children, it is argued that they may be injured thereby. Since DDT is a poison and is not necessary in the production of milk, its presence in interstate shipments of dairy products would constitute a violation of the Federal Food, Drug, and Cosmetic Act. The labels of all insecticides containing DDT must now caution against its use in dairy barns, on dairy animals, or on forage crops to be used for dairy animals or those being finished for slaughter.[9] Had the baneful effects of which DDT now stands accused been deduced and publicized during peacetime, one wonders whether the almost inestimable benefits of DDT would have been made available to the world.

Whatever its deficiencies, DDT made insect-control history by adding the property of residual action to that of insect killing or repellency. Competitive insecticide manufacturers have been driven to frenzied efforts to materialize products more effective than DDT against insects, less toxic to man and his domestic animals, with longer lasting qualities and at lower cost. Chlordane, lindane, chlorinated camphene, Compound 497, and various analogues and variants of DDT—all have made or are making their bids for insecticidal supremacy. There will be many more candidates.

The principle of controlling human disease by abating insect vectors was probably first applied in a purposeful and enlightened fashion by Sir Ronald Ross shortly after he found that malaria was transmitted by mosquitoes (1898).[12] His Italian contemporaries soon showed that paludism was probably disseminated by only one genus of mosquitoes, *Anopheles*[13] and it followed that mosquito control to prevent malaria could be restricted to the species of this group. The target area was further limited by workers in India[14] and Malaya[15] who found that not all anopheline species were concerned, and that it was effective and economical to determine the culprit species, to find the environmental change or sanitary practice most likely to reduce its prevalence, and then to direct all available resources against the important vector. This procedural strategy came to be known as "species sanitation."[16] Some years later, an international triad of malaria experts discovered that *Anopheles maculipennis*, the malaria-carrying species in Europe, was composed of varieties which could be identified only by the appearance of their eggs.[17] Some of these subspecies fed readily on man and thus carried malaria. Others fed only on lower animals; and where these varieties occurred, there was no malaria. This showed that it was

sometimes more profitable to undertake subspecies control than "species sanitation."

As early as 1906, Chagas in Brazil contended that malaria was a domiciliary disease acquired from house-haunting mosquitoes and that the way to prevent it was to kill mosquitoes found in homes.[18] His theory was not tested until sometime during the construction of the Panama Canal when LePrince and Orenstein found that the methodical hand-killing of adult anophelines in tents and labor barracks was not only cheap, but highly effective in reducing malaria sickness rates.[19] This suggestive demonstration was frequently referred to in literature, but no one did anything about it until the mid-thirties when health authorities in South Africa [20] and Holland [16] found that current malaria prevalence could be reduced by treating the interiors of huts or houses periodically with pyrethrum-containing sprays. Workers in India [21] verified the effectiveness and proved the economy of this procedure under tropical conditions. Thus it finally became apparent that greater progress in preventing malaria might be made by decreasing the domestic rather than the areal density of anophelines, that the final pin-pointing of malaria vector control in many parts of the world—perhaps not all—consists in killing mosquitoes which have entered human habitations to feed upon man and which are, therefore, more likely to become infected from him or to transmit malaria parasites to him than are other mosquitoes of the same genus, species, or subspecies.

This is important knowledge. It indicates that domestic insecticiding with space sprays approaches domestic insectproofing in malaria control effectiveness —and surpasses it in economy and applicability in the tropics. It probably explains much of the malaria recession which has continued in this country since 1935.[22] When it was found that the fleeting effects of space sprays could be extended for several months with a single application of a residual insecticide like DDT, the most powerful and thrifty weapon for fighting domestically-acquired malaria had been forged.

The revelation in 1900 of *Aedes aegypti* as the transmitter of yellow fever [23] led to the immediate development of anti-aedine methods of mosquito sanitation. These were devised and applied first in Havana,[24] and then in the Panama Canal Zone.[25] Yellow fever disappeared within months; concurrent anti-anopheline measures reduced malaria to less than a tithe of its former prevalence. These events were significant in mosquito control history; the local eradication of one mosquito-borne disease, and the control of another, in two tropical areas demonstrated irrefutably the soundness and practicability of insect vector reduction as a public health measure.

In 1942 Soper and Wilson announced a new and challenging objective in anti-mosquito operations, namely, the regional eradication of certain vectoral species.[26] The total elimination from northeast Brazil of *Anopheles gambiae* —a vicious malaria transmitter introduced from West Africa—was achieved by the execution of a meticulously thorough program of Paris green dusting, by marginal improvement of breeding places, and by the spraying of houses, airplanes, vehicles, and vessels with pyrethrum insecticides.[27] Adult mosquito capture was used to measure progressive accomplishment. These same procedures were successfully applied later—with the addition of DDT residual spraying—in Upper Egypt where epidemic malaria, developing in 1942, heralded invasion by *A. gambiae*.[28] Similarly intensive campaigns were waged with dramatic success against *A. aegypti* in large areas of Brazil and Bolivia.[29] Even now it seems hard to realize that the last individual member of mosquito species

which swarmed in numberless profusion throughout extensive sectors of the tropics has been annihilated. Yet the irrefragable evidence of time confirms the feasibility of eradicating introduced mosquito vectors, especially in areas of biological isolation.[29] I see no reason why the same sort of tactics cannot be employed successfully in many cases against indigenous species, if the victory is worth the price of the battle.

The post-war availability of residual insecticides has encouraged ambitious attempts at the regional eradication of malaria vectors or of malaria as an endemic disease, and of *A. aegypti* to prevent the establishment of urban yellow fever. Sardinia, Cyprus, and Tobago have been, or still are, engaged in programs aimed at the complete destruction of all anophelines on these islands, using both anti-larval and insecticidal measures. Chile claims to be the first, and at present the only, American country to have exterminated both malaria and anophelism. Her last case of autochthonous malaria was diagnosed in April, 1945.[30] As indicated above, *A. aegypti* has disappeared from Bolivia and much of Brazil.[29] The same appears to be true of the Island of St. Croix.[31]

The United States has been engaged since 1947 in an effort to eradicate malaria—not vector anophelines—within its continental borders. The program is one of DDT application in rural homes in the remaining foci of demonstrated or potential transmission, combined with promotional efforts to improve the diagnosis, treatment, and reporting of malaria cases by physicians.[32] It is believed that domestic anophelism and the occurrence of gametocyte carriers can be reduced simultaneously to the point where transmission cannot take place. Malaria morbidity and mortality rates have declined steadily since 1935, and the disease has reached control status. Eradication is the desired objective, however, as it is evident that economic depressions—with which resurgences of the disease are frequently associated—could have no malariogenic effect if malaria were completely abolished.

The total eradication of *A. aegypti* from the Western Hemisphere was the subject of a resolution in 1947 by the Directing Council of the Pan American Sanitary Organization.[33] This project is to be carried out by the national, state, or local health services concerned, with the technical and coördinative assistance of the Pan American Sanitary Bureau. As of May, 1949, the Director of the Bureau reported that Bolivia was already free of *A. aegypti;* that Chile, Ecuador, and Brazil were nearing the goal; that eradication activities were under way in seven other countries; and that all the other nations except the United States are discussing, planning, or actually organizing such programs.[34]

Another huge undertaking involving insect control is the proposed reclamation of parts of Africa now virtually uninhabitable by either man or domestic beast because of the abundant tsetse fly (*Glossina*) which spreads African sleeping sickness (trypanosomiasis) from parasitized but unaffected wild animals to man, horses, cattle, swine, etc. The area dominated by the tsetse is immense—roughly one and one-half times that of the continental United States.[35] It is largely British, French, and Belgian territory. The British are desperately anxious to avail themselves of the natural resources of the land and have already utilized Economic Cooperation Administration funds to secure the opinions and recommendations of American experts concerning sleeping sickness control or eradication.

What may impress you as being the most audacious and unreserved proposal in the field of insect vector control is the announced antimalarial objective of the World Health Organization which I quote: "The ultimate aim for WHO can, and should be, the eradication of

malaria from the World." [36] This is, of course, a distant and perhaps an unattainable goal, yet I thoroughly believe it is an excellent mark at which to direct our efforts. Ten years ago it would have been difficult to persuade most insect control specialists that malaria vectors could be reduced to the point of extinction on a large island where the disease had been intensely endemic for centuries; that millions of persons facing epidemic typhus could be deloused in a few weeks without even the inconvenience of disrobing them; or that the plague- or typhus-carrying ectoparasites of rats could be reduced below effective transmission levels without the aid of traps, rat poisons, or the Pied Piper of Hamelin. If we go as fast and as far in the next fifty years as we have in the last, it seems reasonable to expect that we will be well on the way to the global eradication of more than one insect-borne disease.

But it takes more than new knowledge, new techniques, and boundless optimism to conquer what Dr. L. O. Howard refers to sepulchrally as "The Insect Menace." [37] For one thing, organizations are necessary to give continuity and resources to field investigations and operations on international as well as national bases. And I submit that magnificent progress has been made in that direction, too.

The Rockefeller Foundation blazed the trail years ago when it established what is now known as its International Health Division. The agents of this unit blithely disregarded national boundaries as they went about over the world investigating, testing, teaching, demonstrating, and assisting in the control and eradicating of insect-borne and other diseases. Official agencies may well emulate the standards of international coöperation set and maintained by this Foundation.

The Pan American Sanitary Bureau dates from 1902 but now operates under the Constitution of the Pan American Sanitary Office adopted in 1947.[38] The Bureau is the central coördinating health agency of the 21 American republics and was designated the Regional Office of the World Health Organization for the "American Area" as of May 1, 1949. It has taken a prominent position in promoting and assisting in the suppression of insect-borne diseases.

The health and sanitation program of the Institute of Inter-American Affairs was initiated shortly after the Pearl Harbor episode to assist in mobilizing the human resources of the two continents.[39] Malaria control has been and remains a major concern. Personal communications lately received from nine Chiefs of Party in Latin American countries indicate programs still under way. Drain-and-fill projects, residual spraying of DDT and other insecticides, training activities at home and abroad, louse control, rat-flea control, *Phlebotomus* control, *A. aegypti* eradication—all are undertaken with national health agencies, and ultimately turned over to them for future expanded services to reduce still further the incidence of insect-borne disease.

Another approach to multinational coöperation comes through professional channels. Twice during 1946, representatives of sanitary engineering and sanitation from both American continents have gathered to discuss mutual problems and objectives. From these meetings, the conviction developed that the engineers as a group could foster a more effective understanding among the Republics by uniting democratically on the basis of common technical interests, rather than as governmentally appointed delegates to conferences. Thus, the Inter-American Association of Sanitary Engineering was formed for scientific and professional purposes, to reach by general agreement the solution of problems relating to sanitation and the establishment of standards for the uniform and continuous

health protection of the inhabitants of the hemisphere.

After existence for two years as an Interim Commission, the World Health Organization came into being on April 7, 1948, to promote "the attainment by all peoples of the highest possible level of health.[40] By June, 1949, the membership included 64 nations. Malaria control is one of the six major health programs originally selected for top priority attention and an Expert Committee on Malaria has been named to advise the WHO on malaria control policies, plans, and activities. The WHO helps its member States to build up national antimalarial organizations and to use the most effective and economical methods of anopheline control. More limited assistance is made available for other programs of insect vector suppression.

This exemplifies, though it does not complete, the roster of international organizations concerned in preventing insect-transmitted disease. National health agencies with insect control interests have developed on a comparable scale.

What we lack now more than anything else is man power. When I say man power, I am referring primarily to public health engineers trained to meet the varying demands for preventing insect-borne diseases just as they are now schooled to prevent sickness spread or caused by water, food, air, industrial processes, and the like.

We often think of insect vector control as applied entomology. It does require entomological knowledge; but to make the most efficient application of this intelligence, individuals are needed who know how to organize and direct large-scale operations involving labor and machinery, procurement and transportation, cost-accounting and operational evaluation. More often than not, these individuals are engineers, though there have been conspicuous exceptions to this rule. There are and will continue to be some bivalent—perhaps I should say trivalent — personalities among our medically and biologically trained confreres who succeed in encompassing much of the other professional specializations of insect control. They get along very well without additional technical assistance—but such persons are rare.

I believe that the engineer and the biologist must work shoulder to shoulder with the physician in solving the problems and producing the benefits of insect control for public health purposes. Where the size of the project warrants professional coöperation, the biological member of the team should utilize his special competency in showing the engineer in terms of vector prevalence when, where, and how to start operations, and when and where they can be safely reduced or stopped. His participation will be large or small, part-time or full-time according to the extent and complexity of the problem, but the operational planning and execution of the insect control activities are primarily engineering responsibilities.

The shortage of engineers to operate insect control projects reflects the lack of training opportunities in this public health specialty. Most of the outstanding personages in this field have had to acquire their competence by experience. That is to their credit, but it is certainly not the prescribed means by which most engineering knowledge is initiated. If the growing demands for qualified insect control personnel are to be met by the engineering profession, the engineering profession must assume the responsibility of preparing them by expanding and multiplying present training facilities.

Actual and potential demands for health engineers with insect control experience are great. In this country, many municipalities are installing or expanding fly control programs to prevent diarrhea. Alaska can be made a more attractive and comfortable place to live

in if it can be relieved of its mosquitoes, black-flies, and sand-flies. The WHO is looking for men to act as insect control consultants or demonstrators. If the President's Point IV Program is activated, the underdeveloped nations of the world will look to this country for professional assistance in ridding themselves of the burden of insect-borne diseases.

The frontiers of insect vector control technology have advanced mightily—as have the means through which this knowledge may be applied. It is hoped that another five years will see equivalent progress in the preparation of professional personnel for work in this field.

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Training Engineers for Public Health

The U. S. Public Health Service sponsored a conference in Washington in January to discuss the education and utilization of sanitary engineers. Present were representatives from the industrial, academic, and public health fields interested in the training and utilization of sanitary and public health engineers. The following recommendations were made concerning training:

1. Future programs of study at the university level that are to be pursued in preparation for the practice of sanitary engineering should encompass a minimum of 5 years of study of mathematics, the basic sciences, and the engineering disciplines. This can be accomplished through 4 years of study leading to a bachelor's degree in engineering followed by 1 year of study leading to a master's degree in sanitary engineering, this additional year to include sanitary engineering subjects and adequate instruction in the principles of public health. It is desirable that this be a program of continuous study.
2. Programs of study at the university level that are pursued in preparation for non-engineering sanitation practice should include instruction in mathematics and the basic sciences adequate to form the foundation for later study in the sciences, the engineering disciplines, or the medical disciplines by those individuals who are qualified to benefit by graduate study.
3. Field training programs can be a supplement but never a substitute for rigorous academic education.
4. No substitution can be made for the skills that the qualified sanitary engineer brings to his work. However, it is realized that within the field of environmental sanitation a wide variety of skills is essential and that trained personnel other than sanitary engineers may possess some of these skills and may apply them successfully in specialized areas.
5. The procurement of young men for the sanitary engineering profession rests on the intellectual and financial attractions of the job. Means should be developed for the advancement of sanitary engineers in their profession and for the lifting of sanitary engineering salaries to higher levels.
6. There is evidence that increased opportunities in public health beyond the technical sanitary engineering field are available to qualified and capable sanitary engineers.
7. It is desirable that the Public Health Service make studies of (a) the need for sanitary engineering personnel in all areas of work where engineering disciplines may contribute to the promotion of health, which study should be sufficiently broad to include both current and future needs, and (b) the rate of loss from the sanitary engineering field, after graduation, of those receiving academic training in sanitary engineering.
8. The principle is reaffirmed that the planning and direction of local environmental sanitation programs should be by competent sanitary engineers and that organization and employment to that end should be advocated and promoted by all public health agencies.

Report on the Recent Outbreak of Jungle Yellow Fever in Panama*

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PRIOR to the recent outbreak, the last confirmed case of yellow fever originating in the Canal Zone or the Republic of Panama was reported by Gorgas [1] May 22, 1907. From that date it was believed that yellow fever was nonexistent in Panama, until Kumm and Crawford [2] in 1943 reported the finding of ten Panamanian rural or jungle localities near the Colombian border where positive mouse protection tests [3] were secured in 27 children born since 1925. All but 2 of these were on Indians or Mestizos (Indian-Spanish mixture) living in the jungles near the Colombian border. This area is about 120 miles from the Canal Zone and the two principal cities of the Republic of Panama. Two positive reactors were found in the jungle 50 miles away. In view of the remoteness of these areas, and because no yellow fever cases or deaths had been reported since 1907, little concern was felt relevant to a possible outbreak or epidemic of yellow fever in Panama.

In mid-January, 1949, the Chief Health Office of The Panama Canal and the Office of the Director of Health, Republic of Panama, were informed of 5 deaths of a questionable nature which had occurred among natives who had lived near the village of Pacora, Republic of Panama, 18 miles east of Panama City. Inquiry revealed that during the months of November and December, 1948, these men had died in the large Panamanian Government hospital in Panama City (Map 1). All died of an acute, febrile disease of less than 7 days' duration and were reported to have had other symptoms (headache, icterus, and black vomitus) which occur in yellow fever. Liver tissue specimens on three of these cases were examined and found to be histopathologically typical of yellow fever. Specimens were sent to the Army Medical Research and Graduate School, Washington, D. C., and to the Rockefeller Laboratory, Rio de Janeiro, Brazil, for confirmation. Both of these laboratories reported [4, 5] these specimens as typically positive for yellow fever.

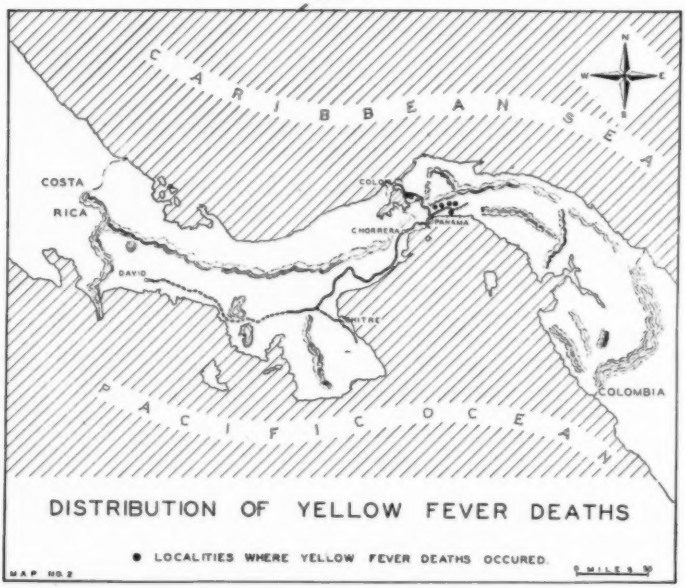
The day following local verification that these deaths had resulted from yellow fever, field investigations were made.

The second of these 5 cases to die, a Panamanian male (T. R.), is illustrative of the findings encountered in the other 4 cases. This man had lived and worked on his farm, a mile east of the middle of the Cabra River. The farm consisted of a clearing in first-growth jungle. He had been working in the rice field near the forest margin when he became ill. After 3 days of illness, he was admitted to the hospital, where he died 2 days later, November 14, 1948.

It was further ascertained that in this immediate area several other men had

* A preliminary report presented before the Epidemiology Section of the American Public Health Association, at the Seventy-seventh Annual Meeting in New York, N. Y., October 28, 1949.

MAP 1



been ill during this period with a similar febrile disease. Some were reported to have had jaundice, and 2 had black vomitus.

Local hunters reported that black howler *(Alouatta palliata-inconsonans)* and white-faced *(Cebus capucinus-capucinus)* monkeys were seen in surrounding forests during this approximate period.

With the histopathological record of positive liver specimens and the findings of the field investigations to confirm the outbreak of jungle yellow fever, all official local and international health authorities were immediately notified.

COÖPERATIVE PROGRAM

A conference of the Chief Health Officer of the Panama Canal and his assistants; the Director of Health of the Republic of Panama; the Surgeons of the Army, Navy, and Air Forces of the Canal Zone; and two advisers from the Pan American Sanitary Bureau; was held to determine a plan of action. It was agreed that the "Yellow Fever Control Program" should be coördinated under one office. A coördinator was nominated by this group. The Health Departments of the Panama Canal and the Republic of Panama requested and received from their respective Governments special appropriations to effect the program.

In the ensuing three weeks, while supplies were being obtained from the United States, teams of vaccinators and mosquito inspectors were trained. Yellow fever immunizations were given to the inhabitants of the cities of Panama and Colon, the communities of the Canal Zone, the Armed Forces establishments in the Canal Zone, and the rural populations in the area where the yellow fever cases had occurred. All incoming and outgoing airplanes were checked for mosquitoes and were sprayed with DDT and pyrethrum in aerosol.

PLAN OF CONTROL PROGRAM

During this same period, plans for an

overall Yellow Fever Control Program were drawn up and accepted. The plan embodied three major objectives:

(1) *Immunizations:* It seemed of primary importance, in order to prevent an epidemic in communities where *Aedes aegypti* might be prevalent, and to minimize the number of sporadic rural or jungle cases which might occur in the future, to immunize, as rapidly as possible, as many of the inhabitants of the Republic of Panama and the Canal Zone as was practicable and economically feasible. Such immunizations were mandatory only for persons living on Armed Forces installations and in the locality where the yellow fever outbreak had occurred.

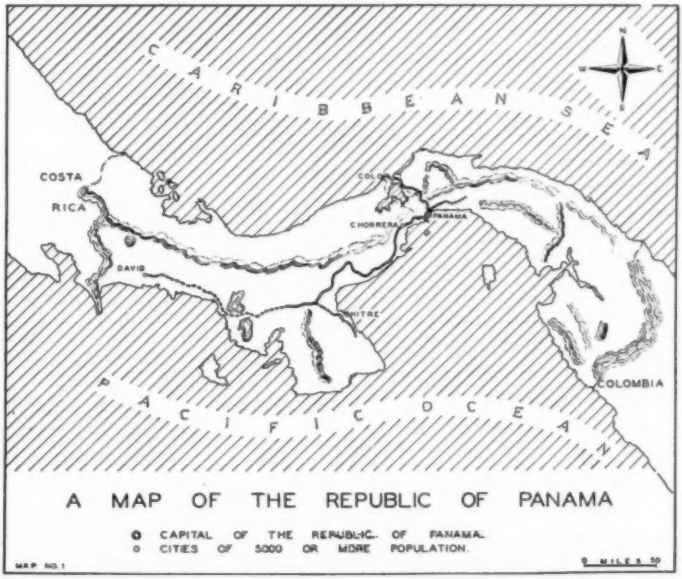
(2) *Aedes aegypti Eradication:* Because of the proximity of endemic yellow fever areas in near-by South American countries, the rapid transport of persons by commercial and military airplanes between these areas and Panama, and the recently proven presence of the virus in the jungles of Panama, it was agreed that the only assurance of protecting the populations of Panama and the Canal Zone against an epidemic of yellow fever would be to eradicate completely the *A. aegypti* mosquito from the country.

Two previously established public health measures were now to pay added dividends by accelerating the *A. aegypti* eradication program. These were:

(a) In 1943, an *A. aegypti* control program was initiated in the cities of Panama and Colon and throughout the Canal Zone. From 1944 until this outbreak, an *A. aegypti* index of less than 0.5 per cent had been maintained.

(b) In 1947, the Department of Health of the Republic of Panama inaugurated an anti-malarial program of adult anophelene mosquito control by spraying the interiors of all houses in malarious regions throughout the Republic with residual DDT. By 1949, 205 towns and villages were being sprayed at regular intervals.

MAP 2



As the *A. aegypti* mosquito is known to be much more susceptible to DDT than the anophelene mosquito, it was reasoned that the towns and villages already under the anti-malarial spray program would be relatively free of *A. aegypti* mosquitoes. Therefore, it was decided that the most effective and economical method of prosecuting the eradication program would be to augment this already well functioning organization in equipment and personnel. This organization would spray additional towns and villages where *A. aegypti* were either thought to be present, or were actually found by our inspection teams.

In addition, trained inspection teams would check all communities not covered by the initial spray program and would inspect all sprayed areas 5 to 6 months after treatment.

To prevent the reintroduction of the *A. aegypti* mosquito, all costal boats would be inspected each time they entered the principal harbors, and at 6 month intervals treated with a 90 per cent wettable powder DDT residual spray. No special measure would be required for airplanes, as all incoming craft were being sprayed in accordance with international agreement.

(3) *Epidemiologic Studies:* In order to determine in what areas the yellow fever virus was active, the direction of its movement, as well as the extent of the jungle reservoir, epidemiologic studies would be made. These studies would include: (a) Blood surveys of the human population; (b) Blood surveys of the monkey population; (c) Viscerotomy service; (d) Entomological studies; (e) Field investigations of suspected yellow fever cases and deaths.

PROGRESS OF PROGRAM UP TO SEPTEMBER 15, 1949

Before reporting any of the results of this program, a few facts should be disclosed concerning the geography and terrain of the country.

Because of the geographical location of the Republic of Panama, the long axis of the country runs east and west, rather than north and south. Thus, the region from the Panama Canal to the Colombian border will be called Eastern Panama; and the region from the Panama Canal to the Costa Rican border will be referred to as Western Panama (Map 2). The only all-weather roads in the country are: a paved Trans-Isthmian Highway between Panama and Colon cities; and one road extending from the west bank of the Canal opposite Balboa, for 350 miles, west to the city of David, in the Province of Chiriqui. This road is excellent for approximately 140 miles, but it is only irregularly passable for the remaining 210 miles. There is but one branch road. It is 40 miles long and is in poor condition. One other poor road extends from Panama City eastward for 28 miles to the town of Chepo, near the Bayano River. There is a mountain range—the Continental Divide—with altitudes ranging from a few hundred feet to over 9,000 feet, which bisects the country from the Colombian to the Costa Rican border. The entire length of this range is bordered by forests and dense jungles, which in turn terminate in tropical swamps washed by the Caribbean Sea on the north and by the Pacific Ocean on the south. From this brief description of the topography of the country, it is readily apparent that one major problem which has been encountered in prosecuting the Yellow Fever Control Program is that of transporting personnel and equipment. The most recent combined population figure for the Republic of Panama and the Canal Zone is approximately 600,000. Of these, one-half (300,000) live in the cities of Panama and Colon, the townsites of the Canal Zone, and the towns and villages along the road previously described. The remaining 300,000 (con-

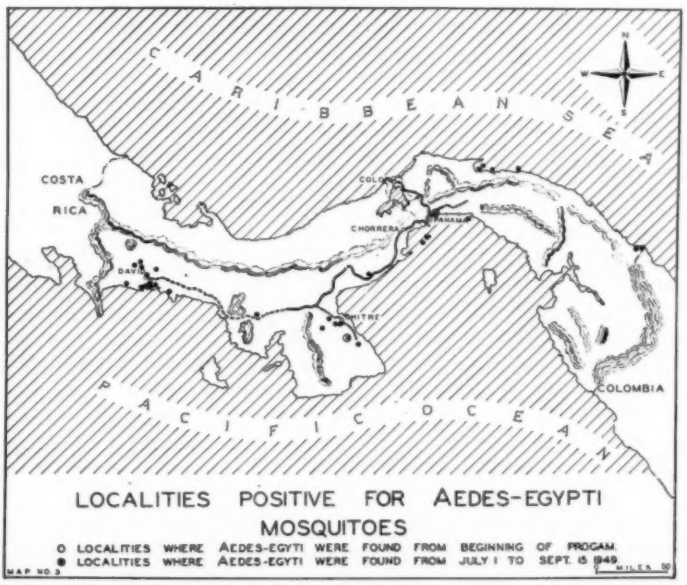
sisting of aboriginal Indians and Mestizos) are scattered throughout the country, living either in tiny villages or communal groups in the jungle marshes, tropical forests, high mountain plateaus, or on extensive archipelagos. To reach these people, every possible form of transportation, including airplane, helicopter, motor boat, dugout canoe, horse, and foot travel, is required. For example, in order to reach the Guaymi Indians (approximately 3,000 in number) on the northern slopes of the mountains of the Province of Bocas del Toro, it was necessary to make a 12 hour sea voyage in a tugboat to the mouth of the Cricamola River; thence 3 hours by motor launch up the river; 4 hours more on the river by dugout canoe; followed by a 2 hour horseback trip; and, finally, 2 additional hours on foot.

Such difficulties of transportation immediately presented us with another serious problem, for although we were able to get our personnel and equipment to these nearly inaccessible areas, inability to provide adequate field refrigeration made it impossible to use the 17D yellow fever vaccine. It was, therefore, decided that the only practical solution was to use the dry Dakar yellow fever vaccine. This vaccine does not require field refrigeration, and application is made cutaneously—in a manner similar to smallpox vaccination. A supply of this vaccine, which has been accepted for international certification by the World Health Organization, was obtained by air from the Pasteur Institute, Dakar, Africa.

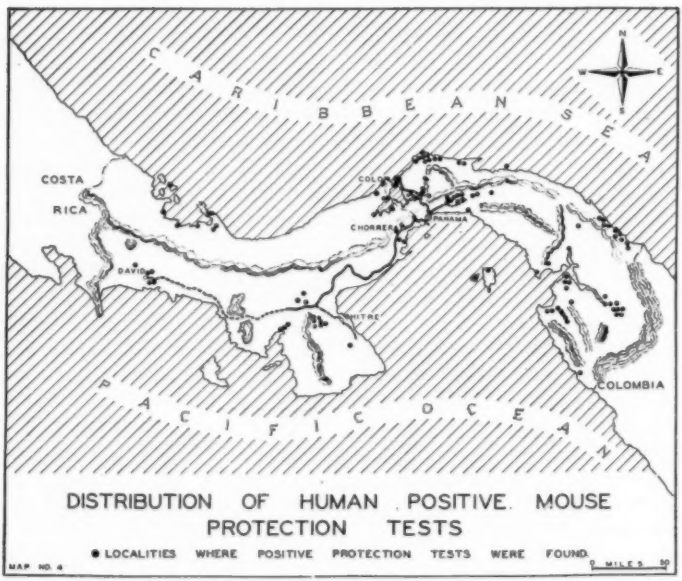
It is believed that this is the first time that the Dakar vaccine has been used for mass immunizations on the American Continent.

The progress which has been made in the three objectives of this program is as follows:

(1) *Immunizations:* The vaccination program was initiated February 1, 1949, and concluded September 15, 1949. In this period, it was frequently necessary for the Coördinator to make advance visits to various semi-wild Indian tribes for the purpose of overcoming superstiMAP 3



MAP 4



tions and competitive interference of the medicine men so that our vaccinating teams would be permitted to perform yellow fever immunizations.

During these 7½ months, 500,000 (83 per cent) of a population of 600,000 were immunized against yellow fever. It was considered nearly physically impossible and economically unsound to attempt to immunize the remaining 100,000.

(2) *Aedes aegypti Eradication:* From the beginning of the *A. aegypti* eradication program in mid-February, until mid-September, a total of 193 villages and towns were sprayed. *A. aegypti* foci (larval breeding places) were found in 31 towns and villages (Map 3). All buildings in these communities were treated with DDT residual spray and the foci were eliminated.

During the 11 weeks, from July 1 to September 15, 1949, only 2 foci were found. These foci were eliminated and the communities sprayed.

(3) *Epidemiology.*

(a) *Blood surveys of the human population:* Prior to inoculations, representative samplings of blood were obtained from young males (15 to 35 years of age) who gave a record of either working or living in the jungles. By September 15, 1949, a total of 732 human bloods had been tested and 100 (13 per cent) found to have positive mouse protection tests. These were from residents dispersed throughout the Republic (Map 4).

(b) *Blood surveys of the monkey population:* A systematic monkey blood survey (for mouse protection tests) was inaugurated in the Cabra River and Pacora forest areas, where the original 5 cases occurred.

Additional bloods have been, and are yet to be, obtained from the monkeys in the forests, east to west, as far as the Colombian and Costa Rican borders.

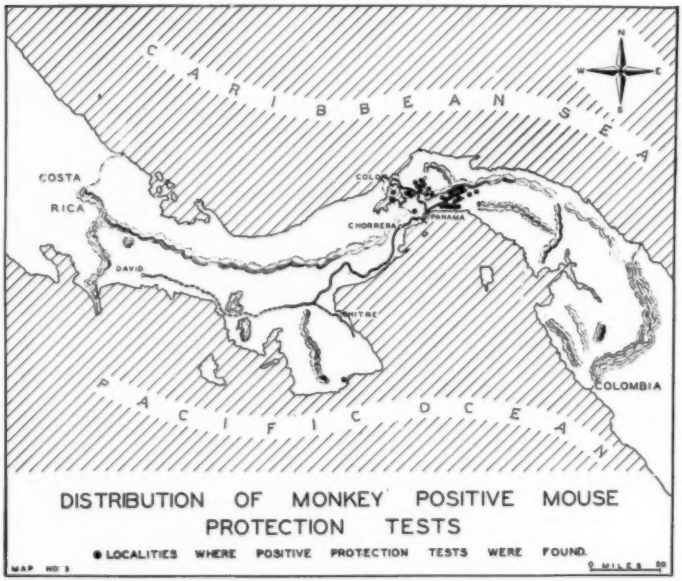
From ten areas, a total of 100 monkey bloods were collected, with 30 (30 per

TABLE 1

Localities Where Primates Immune to Yellow Fever Were Found

	Locality	Specie	Sex	Weight lbs.	Age Estimated
1.	Bayano River	*Ateles geoffroyi Kuhl* (Spider monkey)	M	5	Young adult
2.	Middle Cabra River	*Alouatta palliata inconsonans* (Goldman)—(Black howler monkey)	M	19	Old adult
3.	" " "	" " "	F	14½	Adult (fetus ¾ lbs.)
4.	" " "	*Leontocebus geoffroyi* (Pucheran)—(Marmoset)	—	—	Adult
5.	" " "	*Cebus capucinus capucinus* (Linnaeus)—(White-faced monkey)	F	7½	Young adult
6.	Bayano River (near Canita)	*Leontocebus geoffroyi* (Pucheran)—(Marmoset)	M	1	Adult
7.	Pacora	*Ateles geoffroyi Kuhl* (Red spider monkey)	F	3	Juvenile
8.	Naranjal (midway between Pacora and Chepo)	*Leontocebus geoffroyi* (Pucheran)—(Marmoset)	M	1	Young adult
9.	Upper Cabra River	*Cebus capucinus capucinus* (Linnaeus)—(White-faced monkey)	M	6	Young adult
10.	" " "	" " "	F	9	Adult
11.	" " "	" " "	M	9	Adult
12.	" " "	*Alouatta palliata inconsonans* (Goldman)—(Black howler monkey)	F	12	Adult
13.	" " "	" " "	F	13½	Adult
14.	" " "	" " "	F	13	Adult
15.	" " "	" " "	F	12½	Adult
16.	" " "	" " "	F	8	Young adult
17.	" " "	" " "	F	12	Adult
18.	" " "	" " "	F	13	Adult
19.	" " "	*Cebus capucinus capucinus* (Linnaeus)—(White-faced monkey)	M	9	Adult
20.	Mid-basin Chagres River, near Santa Rosa	*Cebus capucinus capucinus* (Linnaeus)—(White-faced monkey)	M	5	Young adult
21.	" " "	" " " "	F	3	Juvenile
22.	Santa Rosa	" " " "	F	5	Young adult
23.	Las Guacas (opposite Santa Rosa, Chagres River)	*Potos flavus isthmicus* (Goldman) (Kinkajou or Cusimbi)	M	7½	Adult
24.	Tonosi	*Alouatta palliata inconsonans* (Goldman)—(Black howler monkey)	—	—	Adult
25.	West bank of Canal, rear of Barro Colorado, near Abejon Is.	*Potos flavus isthmicus* (Goldman) (Kinkajou)	M	7¼	Adult
26.	Quebrada Grande	*Alouatta palliata inconsonans* (Goldman)—(Black howler monkey)	F	16	Old adult
27.	" " "	" " "	F	12	Adult (3-in. fetus)
28.	" " "	" " "	F	10	Young adult (2-day baby)
29.	Rio Gigantito	*Leontocebus geoffroyi* (Pucheran)—(Marmoset)	M	1	Adult
30.	Orchid Island	*Alouatta palliata inconsonans* (Goldman)—(Black howler monkey)	F	5	Juvenile

MAP 5



cent) having positive tests (Map 5 and Table 1).

(c) *Viscerotomy service:* For additional alert stations, twenty-six viscerotomy posts have been established to obtain liver specimens from persons who die from undiagnosed fevers of 10 days' or less duration. Based upon centuries of Indian and Latin mores, there has been a natural reluctance of the relatives to allow viscerotome punctures on the deceased. Consequently, this service has not been too productive. However, with the additional support of the officials of the Republic, this service should operate more efficiently in providing information concerning yellow fever deaths which otherwise would remain unknown. A total of 40 viscerotome liver specimens have been examined, and, to date, all have been negative for yellow fever.

(d) *Entomological studies:* Although studies of the forest mosquitoes have been in progress, we have not yet been able to establish which mosquito is our local sylvan vector.

To date, we have found no *Haemagogus capricornii* in our forests. *H. spegazzinii* falco and *A. leucocelaenus* mosquitoes (both proven sylvan vectors of yellow fever in nature—Kumm[6]) have, only since the onset of the rains, been found in forests near the areas where the yellow fever deaths occurred. We are now in the process of making viral studies of these two mosquitoes to determine which is our local vector.

(e) *Field investigations of suspected yellow fever cases and deaths:* Four such investigations were made subsequent to the investigation of the original 5 deaths. The first 2 were not yellow fever.

The third investigation was made August 9, 1949, following a report from a hospital in Panama City of an Indian (C. R.) who had died August 7, 1949, and whose liver, upon autopsy the following day, revealed typical histopathologic findings of yellow fever. Investi-

gation revealed that 3 days prior to becoming ill, this Indian had gone to work clearing land on a small farm situated in the jungle on the Atlantic slope of the Continental Divide, 14½ miles south of Colon, and 3 miles west of the Trans-Isthmian Highway. At noon of the 4th day of work, he became ill and was forced to leave his work and seek his bed. The 2nd day of his illness he complained of high fever and severe post-orbital headaches. The next day he was icteric and vomited coffee ground material. He was admitted to the hospital the following morning, and died the night of the day following admission. The total duration of the illness was 5 days.

The farm on which this man had worked is located in the midst of first-growth forest, where he had been clearing additional land on the margin of the farm.

It was reported that a band of black howler monkeys had been noticed in this same forest area two to three weeks prior to our investigation. Seven monkeys were sighted on the ridge across from the farm, and 6 were shot and bled. Three of these monkey bloods showed positive mouse protection tests.

It is important to note that this man had never been immunized against yellow fever. This proven case of yellow fever would appear to have been acquired in the aforementioned area.

The fourth investigation was made Sunday, August 21, 1949, following notification that a patient had been hospitalized in Panama City on August 18, 1949, with a clinical diagnosis of yellow fever. The patient, a Panamanian male (A. B.), aged 20, had been clearing first-growth jungle in preparing land for a banana plantation on a mountain slope at Quebrada El Pato, in the same general forest area as the preceding case. Field investigation revealed a similar pattern to that described in the third investigation.

SUMMARY

1. Herewith, the first proven outbreak of jungle yellow fever in Panama is presented in a preliminary report.
2. Seven known yellow fever deaths have been recorded, 5 of which were verified by liver tissue specimens which demonstrated classical yellow fever histopathology.
3. In 7½ months, 500,000 (83 per cent) of a population of 600,000 were immunized against yellow fever.
4. Positive mouse protection tests on blood sera from monkeys and young humans have been presented from widely scattered jungle and forest regions of the Republic of Panama and the Canal Zone.
5. Presented, also, is the current status of the *A. aegypti* eradication program in the Republic of Panama and the Canal Zone.
6. As far as can be ascertained, this is the first time that Dakar yellow fever vaccine has been used for mass vaccinations on the American Continent.
7. In conclusion, the remark of Rae [7] concerning yellow fever outbreaks is, as elsewhere, equally applicable here: "The history of yellow fever—to anyone who has to do with outbreaks of the disease—has two phases. The first during the outbreak is one of extreme fear and perturbation, but this is followed when the emergency ceases by an unwarranted feeling of complacency. We can never afford this complacent attitude."

Acknowledgments are made to the following:

Minister of Labor, Social Hygiene, and Public Health and the Director of Public Health, Republic of Panama; for their ever-ready encouragement and official assistance with this program.

Dr. Herbert C. Clark, Director, Gorgas Memorial Laboratory, Panama, Republic of Panama; for his timely advice and guidance, as well as his never-tiring efforts in obtaining monkey bloods for our epidemiologic studies.

Dr. Manuel Roca Garcia, Director, Carlos Finlay Institute, Bogota, Colombia; for the invaluable assistance of him and his staff in performing mouse protection tests on the human and monkey bloods obtained for these studies.

Dr. Pedro Galindo, Director, Anti-Malarial Service, Republic of Panama; for effecting DDT spraying of *A. aegypti* positive villages, as well as his work in connection with the study of our jungle mosquitoes for identification of the sylvan mosquito vector in Panama.

The Pan American Sanitary Bureau; for promptly providing experts to train our yellow fever vaccinators and mosquito inspectors.

The United States Army, Caribbean Command; the United States Air Force, Caribbean Air Command; and the Fifteenth Naval District of the United States Navy; for providing transportation (air and other forms) and for initiating *A. aegypti* eradication in their respective areas.

Others: Rockefeller Laboratory, Rio de Janeiro, Brazil; Pasteur Institute, Dakar, Africa; U.S.P.H.S. Laboratory, Montana; Board of Health Laboratory, Gorgas Hospital, C. Z.; other divisions of The Panama Canal; for very courteous and prompt assistance in supplying vaccine and confirmatory laboratory reports for our studies.

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Mid-Century Conference on Children

The November *Journal* (p. 1503) had a brief news item on the Mid-Century White House Conference on Children, the fifth in a series that has been held in each decade of the 20th century. Each has had a specific emphasis. That of the 1950 Conference to be held in December is the mental, emotional, and spiritual growth of children into happy adults and responsible citizens, "toward a mature generation," as it were.

Among the four advisory councils of the Conference is one on Participation of National Organizations. Dean Roberts, M.D., represents the A.P.H.A. on this Council's steering committee, made up of representatives of 59 national agencies.

"Toward a Mature Generation" has been prepared as a questionnaire or guide for state committees in gathering information for the White House Conference. The Conference is planned so that the three stages, pre-conference, conference, and post-conference, shall all contribute to the advancement of child welfare. The data gathered by state and local groups and the various committees will be the basis of Conference conclusions and recommendations. In the post-Conference era the same groups will be the channels for citizen implementation of recommendations.

It is expected that the information on current practices in child health conferences gathered by the A.P.H.A.'s Committee on Child Health will be of use to the Committee on Fact Finding of the White House Conference. Dr. Atwater is a member of the Conference Program Committee. The National Health Council has been asked to serve as liaison between the Conference and the member agencies of the Council.

Serologic Studies in Histoplasmosis*

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THE coincidence of pulmonary scarring or calcified nodules and histoplasmin skin sensitivity in tuberculin-negative persons was first described in detail by Christie and Peterson [1] and Palmer.[2] These and subsequent studies [3-16] have emphasized that lesions which in the past would have been interpreted as tuberculous in origin may be the result of an infection with *Histoplasma capsulatum* or some other related organism.

Widespread surveys correlating the roentgenographic appearance of pulmonary infiltrates with histoplasmin sensitivity, as well as recent descriptions of non-fatal cases [17, 18] have not only stimulated interest in the disease process known as histoplasmosis but have considerably altered the earlier concept that infection with *H. capsulatum* was rarely encountered and invariably fatal. The increasing cognizance of this alternate concept has resulted in a relatively larger incidence of detected infections. This, in turn, lends support to the postulate that histoplasmin sensitivity may be a direct result of previous infection with *H. capsulatum* and that a benign form of the disease is prevalent throughout a wide geographical area of the United States. The correctness of such a postulate can be strengthened by detecting a sufficient number of cases in the early acute phase of the disease. Unfortunately, the exact diagnosis of an infection so protean in nature as histoplasmosis, is not without its complexities and at present is largely dependent upon the isolation of the organism from infected tissues. This latter procedure, even in fulminating cases, is sometimes achieved only with great difficulty.

Several groups of investigators [19-27] have therefore turned to evaluating the use of serologic tests for the detection of humoral antibodies against *H. capsulatum*. Preliminary results of such studies in this laboratory [24, 27] as well as those conducted by Salvin [19] and by Furcolow and associates [21] have indicated that they may be of value as an aid in the diagnosis of histoplasmosis.

Studies in this laboratory have utilized two basically different tests and antigens. For the complement-fixation test a ground antigen derived from the yeast phase of *H. capsulatum* [23, 24] has been employed, since this is the form in which the organism is found in parasitized tissues. Conversely, the skin test antigen, histoplasmin, derived from the mycelial phase of the organism was incorporated into the collodion agglutination technic.[26-27] The nature of this antigen lends itself admirably to this latter procedure in that union with the microscopic collodion particles is readily achieved and positive agglutinations are macroscopically visible and distinct.

The data presented herein include the results obtained with sera from "normal" individuals, both skin test positive or negative, suspected or proven cases of histoplasmosis, and from persons representing a variety of illnesses.

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TABLE 1

Repeatability of Quantitative Tests for Histoplasmosis Using Immune Rabbit Serum

Specimen Number	Tests	Titers Frequency							
		< 1:5	1:5	1:10	1:20	1:40	1:80	1:160	1:320
1	10 F*	9	1						
	10 A+	10							
2	10 F	2	4	4					
	10 A	10							
3	10 F						8	2	
	10 A					10			
4	9 F					8	1		
	9 A			3	6				
5	5 F								5
	5 A							5	
6	5 F				1	2	2		
	5 A				4	1			

F*—Complement-fixation
A+—Collodion Agglutination

METHODS

The complement-fixation technique employing ground yeast phase antigens in the presence of serial serum dilutions and the 50 per cent endpoint of hemolysis has been previously described [22-24] as has the collodion agglutination test.[25-27]

RESULTS

Repeatability of tests—In order to evaluate the reliability and reproducibility of the two tests a number of human as well as rabbit serum specimens were divided into a series of separate tubes and labeled with numbers in such a manner that only the referee knew the contents of each tube. Four persons then performed the dilutions of the serum specimens, selected at random. Because of this latter factor, a one-tube dilution variation in results was to be expected and was not considered out of the range of probability. Such studies demonstrated that over 98 per cent repeatability was obtained in both tests, utilizing either rabbit or human sera. Table 1 demonstrates the results obtained with a representative group of immune rabbit sera of varying degrees of reactivity. On the basis of repeated observations of this nature it was assumed that the techniques and materials employed were reliable and that the results obtained on test samples were not often affected by chance variations in the performance of either serologic test.

Results with miscellaneous human sera—In order to ascertain the presence or

TABLE 2

Complement-fixation Reactions with Human Sera

Number of Persons	Skin Reactions	Number of Sera Fixing Complement Serum Dilutions 1:5	1:10	1:20	1:40	Total	Per cent
230	Positive	8	15	5	3	31	13.5
323	Negative	4	10	2	0	16	4.9
Total 553		12	25	7	3	47	8.5
303	?	6	14	3	2	25	8.2

absence of detectable humoral antibodies in so-called "normal" ambulatory persons, complement-fixation tests were performed on a total of 553 serum specimens obtained from a heterogeneous adult group representing residents of nearly every state in the union. Of this number, 230 were from skin-test-positive persons and 323 from individuals failing to react to histoplasmin. As noted in Table 2, 31 sera, or 13.5 per cent of the skin-test-positive group fixed complement in serum dilutions varying from 1:5 to 1:40. Relatively few reactions were obtained at the higher dilutions—viz: 5 or 2.2 per cent at 1:20 and 3 or 1.3 per cent at 1:40. Of the skin-test-negative group, 16 or 4.9 per cent of the 323 sera fixed complement in 1:5 to 1:20 dilutions. Thus, relatively more positive reactions were obtained in the skin-test-positive group. Also, as can be seen in Table 2, 25 or 8.2 per cent of 303 random sera originally submitted for other studies and on which skin sensitivity data were not available showed complement-fixing antibodies. This latter figure is remarkably close to that of 8.5 per cent attained in the combined total of both the skin-test-negative and -positive group above.

A similar study with the collodion agglutination technique revealed, as demonstrated in Table 3, that agglutination was obtained in 55 or 26.7 per cent of 206 skin-test-positive persons and in 65 or 21.4 per cent of 303 skin-test-negative individuals. All but 7 of these sera gave weak 1+ to 2+ reactions in low titer which we have not considered as significant (4+) in terms of active infection. The 7 sera giving 4+ reactions were from student nurses, of whom 5 were converters from Kansas, Ohio, Michigan, and Minnesota. The sixth was an Ohioan with questionable pulmonary calcification and the seventh a skin-test-negative, x-ray negative person from Kansas City. A total of 103 or 25.5 per cent of a miscellaneous group of 403 serum specimens yielded weak reactions. The 25.5 per cent is likewise remarkably close to the combined reactor rate of 23.6 per cent of the skin-test-positive and -negative group above.

The above results indicated that the presence of antibodies against either the yeast phase antigen or histoplasmin may occur in low dilutions in a small percentage of individuals exhibiting no evidence of the specific disease, and tends to emphasize the well known serologic fact that results on single specimens should not supersede the value of serial studies where a more critical evaluation of test results can be made in terms of the clinical picture.

Results with serum from proven cases—The ideal manner of evaluating the humoral antibody response to any organism is to obtain serial serum specimens during the course of the disease process. Aside from the difficulties normally encountered in the early diagnosis of

TABLE 3

Collodion Agglutination Reactions with Human Sera

Number of Persons	*Skin Reaction*	*No. of Sera Causing Weak Agglutinations (1+ — 2+) Serum Dilutions* 1:5	1:10	1:20	1:40	*Total*	*Per cent*
206	Positive	20	15	14	6	55	26.7
303	Negative	25	27	10	3	65	21.4
Total 509		45	42	24	9	120	23.6
403	?	51	31	17	4	103	25.5

TABLE 4

Early Serologic Picture in Two Non-Fatal Cases

		Serum Dilution								
Case 1										
Date '48		*1:5*	*1:10*	*1:20*	*1:40*	*1:80*	*1:160*	*1:320*	*1:640*	*1:1280*
8/24	F *	0	0	0	0	0	0	0	0	0
	A †	4+	4+	4+	4+	4+	3+	±	—	—
9/5	F	0	0	0	0	0	0	0	10	85
	A	ND				ND				ND
9/25	F	0	0	0	0	0	0	0	50	100
	A	4+	4+	4+	3+	2+	±	—	—	—
10/29	F	0	0	0	0	50	100			
	A	4+	4+	3+	2+	1+	—			
12/21	F	0	10	20	45	100				
	A	—	—	—	—	—				
Case 2										
8/24	F	0	0	0	50	100	100	100	100	100
	A	3+	3+	1+	—	—	—	—	—	—
10/20	F	0	0	0	0	0	45	100	100	
	A	4+	4+	4+	2+	1+	—	—	—	
2/10/49	F	×	45	95	100	100				
	A	1+	±	—	—	—				

F * — Complement-fixation — Positive = 50% or less Hemolysis
A † — Collodion Agglutination

TABLE 5

Serologic Picture in Rabbit, Infected with H. capsulatum

Number 3637

		Serum Dilution					
Week After Infection		*1:5*	*1:10*	*1:20*	*1:40*	*1:80*	*1:160*
0	F *	—					
	A †	—					
1	F	—					
	A	—					
2	F	0	0	0	0		
	A	4+	3+	1+	—		
3	F	0	0	0	0	0	30
	A	4+	4+	4+	4+	2+	±
5	F	0	0	0	0	40	
	A	4+	4+	2+	1+	—	
7	F	0	0	0	10	50	
	A	3+	2+	1+	—	—	
9	F	0	0	50			
	A	2+	1+	±			
12	F	0	20	60			
	A	2+	1+	1+			
18	F	30	80				
	A	—	—				
22	F	40	100				
	A	—	—				
26	F	65	100				
	A	—	—				

F * — Complement-fixation — Positive = 50% or less Hemolysis
A † — Collodion Agglutination

histoplasmosis, dependence upon sera referred from widely distributed sources makes such serial studies difficult to obtain. The present study, of necessity, therefore includes a number of single serum specimens that were obtained sometimes as late as 2 to 3 years after the diagnosis had been made. However, by fortuitous circumstances, sera were obtained shortly after the onset of illness from 2 children exhibiting classical symptoms of histoplasmosis. Subsequent serial studies presented a working background for comparison with the antibody response in other patients. The early serologic findings in these boys has been previously reported [24, 27] and the detailed history of the cases will be presented elsewhere.[18] Briefly, these 5 and 8 yr. old cousins living on the same farm in central Ohio were admitted to the hospital within a few days of each other. Although acutely ill they recovered spontaneously and are now living and well over 1 year later. A review of their chest films depicts the marked early pulmonary involvement with subsequent resolution and after about 8 months suggests early calcification. The serologic response of these patients has been charted in Table 4. It was on the basis of the high titers obtained within the 2nd to 3rd week of illness that cultural studies for *H. capsulatum* were instigated and carried out successfully. The initial high titers declined comparatively rapidly and levels obtained after 4 to 8 months, as noted below, were not unlike those observed in chronic cases or in a small number of so-called "normal" individuals. This transient nature of antibody response aroused our interest considerably and subsequent studies [28] with rabbits have likewise demonstrated that the majority of experimentally infected animals showed the highest peak of antibody titer 2 to 4 weeks after infection, and that within 5 to 8 months the titers had dropped off to baseline levels. Table 5 demonstrates the response in a representative animal.

Thus, it was not unexpected when certain serum specimens from known proved cases failed to demonstrate appreciable antibody titers. Sera from 16 cases, including the 2 above mentioned, were investigated by both tests for antibody content, and the results are shown in Table 6. The diversity of age, clinical status, and time of serum withdrawal present some difficulties in evaluation. Eleven of these patients are living while 5 died.

In the former group, excluding cases 1 and 2 discussed above, a single serum specimen obtained from No. 3 on the 4th month of illness fixed complement at 1:80 while the collodion agglutination test gave 4+ reactions and a titer of 1:40. This patient has also made a complete recovery.

Patient No. 4 who has had several bouts of vague undiagnosed illness for the past 2 years, which may or may not have been histoplasmosis, developed antibodies in his most recent episode and *H. capsulatum* was isolated from his larynx. During the 5th, 7th, and 8th months of his present illness, complement-fixation antibodies were present only in low titer (1:10). However, collodion agglutination reactions were positive at 1:80–1:160 during this period. We have insufficient data at this date to explain why the latter test showed such an appreciably higher titer. Serum from patients with evidence of chronic disease (Nos. 5–9), obtained from 8 months to several years after clinical onset, showed complement-fixation antibodies in low titer (1:5 to 1:40). These titers were comparable to those observed in the small percentage of so-called "normal" individuals discussed above. No 4+ collodion agglutinations were obtained in any of these sera. Case No. 10 represents the results obtained with the serum of an infant with disseminated histoplasmosis in which recovery is not expected. A single serum

TABLE 6

Serologic Reaction According to Approximate Month of Disease

Case No.	*Test*	*Age*	*Status*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*12*	*18*	*24*	*24+*	*Comments*
1	F * A †	C	L	1:1280 1:160	1:320 1:80	1:80 1:80		1:40 —								R
2	F A	C	L	1:40 1:20		1:160 1:80				1:10 —						R
3	F A	A	L				1:80 1:40									R
4	F A	A	L					1:10 1:80		1:10 1:80	1:10 1:160					Laryngeal R — possible
5	F A	A	L									1:10 —	1:5 —	1:5 —		Chronic
6	F A	A	L								1:10 —					"
7	F A	A	L									1:5 —				"
8	F A	A	L											1:20 —	1:20 —	"
9	F A	A	L											1:40 —	1:20 —	"
10	F A	I	L				— —									Acute disseminated R — unlikely
11	F A	I	L					— —			— —		— —			R — old serum
12	F A	A	D			1:40 1:40	D									Pharyngeal disseminated
13	F A	O	D				D —									Autopsy Blood
14	F A	O	D				— 1:20	D								Laryngeal
15	F A	O	D									1:10 —	1:10 —	D —		
16	F A	A	D									— —				7 weekly samples negative—Disseminated

F * — Complement-fixation
A † — Collodion Agglutination

C — Child
A — Adult

I — Infant
O — Old

L — Living
D — Dead

R — Recovered

specimen, obtained approximately in the 4th month of illness, showed no antibodies. Case No. 11, an infant who recovered from the disease, showed no antibodies at 4, 8, and 12 months. If an antibody response occurred it may have been present earlier in the disease or the fact that these particular serum specimens were about 2 years old may have accounted for the lack of detectable antibodies.

The 5 fatal cases were all adults, 3 of whom were aged persons. Serum from case No. 12, in which pharyngeal histoplasmosis with dissemination resulted in rapid termination 4 months after onset, showed a 1:40 titer in both tests during the 3rd month. Knowledge of antibody response earlier in the disease, in this case, would have been of considerable interest. Case No. 13, who also died with the disseminated form in the 4th month, showed no antibodies in blood obtained post-mortem. Case No. 14, with pharyngeal histoplasmosis, showed no complement-fixation antibodies in the 4th month or 1 month prior to death, but did have a 1:20 titer in the collodion agglutination test. Thus, like the other 2 laryngeal or pharyngeal forms above (No. 4 and No. 12) collodion agglutination reactions were consistently positive. Case No. 15 represented a chronically ill old man who showed complement-fixing antibodies in low titer (1:10) at 12 and 18 months, but none at the time of death 2 years after onset. Collodion agglutinations were negative throughout.

Serum at weekly intervals obtained from a fatal disseminated case (No. 16) showed no demonstrable antibodies with either test during the last 7 weeks of life.

Results in suspected cases—At present the serologic picture is being followed in 2 children who present symptoms highly compatible with early acute histoplasmosis and in whom recovery seems likely.

Table 7 shows the antibody titers noted thus far in these 2 children. Serum obtained from "A" shortly after the onset of illness fixed complement at 1:40 and gave a positive collodion agglutination through 1:160. These results suggest active infection. After 3 months the complement-fixation titer was 1:20 and the collodion 1:80. In case B the exceptionally high complement-fixation titer of 1:320 and the 1:80 collodion results likewise seem to confirm the clinical impression of histoplasmosis. The early serologic results

TABLE 7

Early Serologic Results in Two Children with Clinical Picture Suggestive of Histoplasmosis

Case	Month of Disease	Test	Serum Dilutions 1:5	1:10	1:20	1:40	1:80	1:160	1:320	1:640	1:1280
A	1	F *	0	0	0	5	100				
		A †	4+	4+	4+	4+	4+	1+	—		
	2	F	0	0	0	30	100				
		A	4+	4+	4+	3+	1+	—			
	3	F	30	35	50	80					
		A	4+	4+	4+	4+	2+	—			
B	1	F	0	0	0	0	0	0	0	0	60
		A	4+	4+	4+	4+	3+	1+	—	—	—
	2	F	0	0	0	0	0	0	0	0	80
		A	4+	4+	4+	3+	1+	—			

F * — Complement-fixation — Positive = 50% or less Hemolysis
A † — Collodion Agglutination

obtained thus far are similar to those discussed in the proved cases 1 and 2 above. Efforts to recover this organism have thus far been unsuccessful, but in view of the difficulty encountered in other infections such as brucellosis and certain forms of tuberculosis one may have to rely on other laboratory data to support the clinical diagnosis. It is precisely in this type of case that serologic tests could be most useful as a diagnostic aid.

DISCUSSION AND SUMMARY

The studies described herein as well as similar ones by Salvin[19] and by Furcolow, Bunnell, and Tenenberg,[21] tend to substantiate the observations from this laboratory on the potential value of serologic studies in the laboratory diagnosis of histoplasmosis.[24, 27] Because of previously reported cross-reactions between *H. capsulatum* and other antigens[13, 22-27, 29, 30] and low antibody levels sporadically appearing in certain individuals with no known history of the disease, it is felt that the quantitative methods applied throughout these studies are of importance.

Quantitative methods readily differentiate low-titered sera from those showing a marked antibody content and offer a means of comparing homologous and heterologous titers when related antigens such as *Blastomyces dermatitidis* are simultaneously titrated. Both of these aspects are important in the elimination of nonspecific reactions and in the eventual evaluation of serologic studies in this disease. Skin sensitivity does not necessarily imply the coincidence of circulating humoral antibodies. Thus, the occurrence of positive serologic findings in only a small percentage of skin-test-positive individuals is not improbable. By alterations of technique, the sensitivity of the employed tests might be increased to such an extent that a higher correlation between skin reactivity and humoral antibodies could be obtained. However, this could also lead to decreased specificity. Since it has been our purpose to devise a test which would assist in the diagnosis of the active disease process, the procedures developed have been directed toward detecting antibody levels of greater intensity than those observed in "normal individuals," or in persons merely reacting positively to histoplasmin. We again emphasize the importance of serial specimens for more accurately evaluating the relationship of humoral antibodies to the disease process, since in both human and animal studies the transient nature of the antibody response has been marked. Failure to augment early clinical suspicion of histoplasmosis with serial serologic studies has undoubtedly greatly increased the number of cases forever relegated to the "fever of undetermined origin" category. On the other hand, positive serologic findings early in the disease may result in a more intensive and appropriate search for the causative organism, and thereby increase the number of definite diagnoses. This does not imply that antibodies will always be found early in the disease for in the rapidly fulminating forms our tests have shown titers to be minimal or entirely lacking. More cases will have to be studied before one can fully evaluate this and many other as yet untouched aspects of the disease. However, on the basis of our very limited observations, it is our feeling that the absence of antibodies in high titer early in the disease indicates a poor prognosis, while a self-limiting course may be expected in cases showing an appreciable antibody response.

After further experience and many, many more observations, it is possible that serologic studies may contribute not only to a better diagnosis but also to a more adequate evaluation of the prognosis. High incidence of skin-sensitivity to histoplasmin and an increasing number of reported non-fatal cases indicate

that histoplasmosis is a relatively more common disease than previously supposed, but the final solution of this fascinating problem lies in synthesizing the efforts of various investigators with diverse avenues of approach, including those of Emmons [31, 32] and many others. The serologic aspects as conducted in this and other laboratories may contribute to the armamentarium of the physician. The preliminary observations made thus far that the diagnosis of histoplasmosis can be accelerated by serologic methods is encouraging.

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Histoplasmosis: Animal Reservoirs and Other Sources in Nature of the Pathogenic Fungus, Histoplasma*

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THE discovery that *Histoplasma capsulatum* has a saprophytic development in soil,[6] and that histoplasmosis occurs commonly in certain species of wild and domestic animals,[7-12] has provided a new method of attack on the problems of the geographic distribution of histoplasmosis and the meaning of prevalent histoplasmin skin sensitivity.

The geographic distribution of human histoplasmosis is currently a subject of great importance. The occurrence of proved fatal histoplasmosis in many parts of the world[15] clearly indicates a wide geographic distribution of the disease. The interpretation that a reaction to the histoplasmin intradermal test in the presence of non-tuberculous pulmonary calcification indicates healed benign histoplasmosis, envisages a limited geographic area in which histoplasmosis is prevalent, extending from Kansas City eastward and from southern Iowa and Ohio south through Tennessee.[13] These two conflicting views so far have not been resolved by either the collection of a sufficient number of proved human cases or by laboratory confirmation of the etiologies of the benign diseases which cause non-tuberculous pulmonary calcification, although *Histoplasma* has been isolated from a few persons reported cured at the time of the report.[1, 16] The comparative rarity of proved human cases of histoplasmosis, the difficulties in the way of isolating an etiologic agent from the precalcific lesions of the benign pulmonary disease, the nonspecific nature of histoplasmin, human mobility with consequent exposure of those persons tested to many unknown sensitizing antigens both foreign and local, and our ignorance of how many antigens can sensitize man to histoplasmin, have made a critical determination of the etiology of benign pulmonary calcification difficult.

An answer to the question of whether histoplasmosis is commonly present outside the areas of high histoplasmin sensitivity would aid in interpreting the histoplasmin skin reaction and in settling the moot point of whether prevalent histoplasmin sensitivity and pulmonary calcification bear any relationship to human histoplasmosis. The techniques of finding human cases of histoplasmosis and of histoplasmin skin testing do not offer easy or early answers to the problems of geographic distribution and interpretation of histoplasmin sensitivity. The technique of examining suitable species of animals for histoplasmosis by geographic areas may give an answer to both.

The search for animal reservoirs of mycoses important in human medicine

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deserves more attention than it has received. A recent paper by Saunders[14] gives a useful review of systemic mycoses reported in domestic animals. In 1943, in reviewing the subject of coccidioidomycosis in wild rodents and reporting new data, I pointed out that the isolation in culture of the fungus from suitable species of rodents could be used as a method for indicating precisely the geographic limits of coccidioidomycosis and that this method offered certain obvious advantages over skin testing and the recognition of human cases.[5] Later observations[4] have shown that one assumption made in that paper, viz., that the geographic distribution of *Haplosporangium* coincides with that of *Coccidioides*, was erroneous. The error was demonstrated by applying the method in other areas.

Recent studies at the National Institutes of Health have shown that another mycosis, histoplasmosis, also occurs commonly in certain animal reservoirs and the application of animal surveys can be expected to elucidate some of the current problems in the epidemiology of histoplasmosis. Part of these studies have been reported[7, 9-12] and the purpose of this paper is to summarize data on the 84 strains of *H. capsulatum* which we have isolated to date from animals, to report one new animal host, to record 4 additional isolations of *H. capsulatum* from soil, and to discuss the geographic distribution of the isolations from animals and soil by farms within one rural county and by larger areas on a broad geographic basis. The search for histoplasmosis in rats in other areas has been made possible through the coöperation of other individuals whose interest and freely given aid will be acknowledged in connection with specific surveys.

Isolations of *H. capsulatum* from the dog,[11] mouse,[11] brown rat,[9, 10] roof rat,[10] cat,[12] and spotted skunk,[10] have been reported previously. The search for histoplasmosis in animals has been continued in Virginia and Georgia, and to the end of September, 1949, we have isolated *H. capsulatum* from 5 dogs, 1 house mouse, 47 brown rats, 4 roof rats, 19 cats, and 7 spotted skunks.

In addition to the above species, one opossum *(Didelphis virginiana)* has been found in Virginia with histoplasmosis. This is the first report of histoplasmosis in this species. The animal was captured on a farm where 123 rats had been trapped previously without finding histoplasmosis. *Histoplasma* was isolated from the liver only and cultures made from spleen and adrenal remained sterile.

Following the successful search for histoplasmosis in animals in Virginia and Georgia, similar studies have been made in three other localities. These have not yielded infected animals and a discussion of these studies seems pertinent to a discussion of animal reservoirs and the methods necessary to detect them.

Through the courtesy of Dr. David E. Davis, cultures for fungi were made from rats collected during the course of an ecologic study of rats in Baltimore, Md., and on a farm located about 16 miles from Baltimore.[3] The animals were brought alive to the laboratories of the Rodent Ecology Project, Department of Parasitology, School of Hygiene and Public Health, Johns Hopkins University, for tabulation of measurements, collection of parasites, and bacteriologic studies.

Dr. Huan-Ying Li carried out bacteriologic studies and in addition, when the time schedule permitted, made additional cultures for fungi. Cultures were made from spleen and liver separately or from pooled specimens of spleen, liver, and kidney from each of 629 brown rats *(Rattus norvegicus)* between July 1, 1948, and July 1, 1949. Although this represents only a fraction of the animals collected for ecologic studies during the period, the only selection of animals for histoplasmosis studies was on the basis

of time available for preparing these additional cultures. One hundred and nine of the rats were collected from a farm located 16 miles from Baltimore and 520 were collected in 3 areas covering about 20 city blocks within the city of Baltimore. Although the sample appears ample and the rats were collected practically throughout the year, *Histoplasma* was not isolated from any animals in this series.

A second small series of brown rats was supplied also by the Rodent Ecology Project of the Johns Hopkins School of Hygiene and Public Health. Dr. John B. Calhoun had established a colony of rats at Towson, Md., in order to study ecologic and sociologic factors influencing rat populations.[2] The rats were kept in a half-acre pen subdivided to simulate natural conditions. Local wild rats were excluded from the pen. This study was terminated in May, 1949, and Dr. Calhoun generously supplied this laboratory with 64 animals for examination.

Cultures were made at the National Institutes of Health laboratory from spleen, liver, adrenal, urinary bladder, and lung. *Histoplasma* was not isolated from any of the 64 animals.

The third series of animals to be reported in this paper was made available through the courtesy of Dr. Carl Mohr, In Charge Rodent Control, Communicable Disease Center, Atlanta. Seven hundred and forty-four of the animals collected for typhus and plague studies at Brownfield, Tex., were examined by culture for histoplasmosis. Virgil I. Miles, Officer in Charge of this study, oversaw the preparation of cultures from collected animals after a preliminary visit by the writer to the area.

Animals were collected in Andrews, Cochran, Dawson, Ector, Gaines, Hockley, Lubbock, Midland, and Yoakum Counties, Texas, during April, May, and June, 1949. They included 6 specimens of *Citellus mexicanus*, 11 *C. spilosoma*, 1 *C. tridecemlineatus*, 6 *Cynomys ludovicianus*, 32 *Dipodomys ordii*, 16 *D. spectabilis*, 617 *Neotoma micropus*, 17 *Onychomys leucogaster*, 9 *Rattus norvegicus*, and 10 *Sylvilagus auduboni*. Because of the circumstances under which the study was planned, cultures had to be made in most instances in the field at the rear of the laboratory truck without protection from wind and dust. Furthermore, snap traps were used in this study and almost all the animals had been dead several hours before cultures could be made. Consequently, cultures were badly contaminated. Because of the circumstances, cultures were made only from spleen, liver, and lungs. *Histoplasma* was not isolated from any of these animals, but it is interesting to note that *Haplosporangium parvum* was isolated from the lungs of 4 *Neotoma*, 2 *C. mexicanus*, and 1 *Onychomys*.

Failure to find *Histoplasma* in rats from Baltimore and Towson and from various wild species in Texas may have been due to inadequate samples, faults of technique or the actual lack of infected animals in those areas. Experience in Virginia indicates that the latter explanation is plausible. Over a period of 3½ years rats have been collected from 42 premises (farms, in nearly all cases) in Loudoun County, Virginia. Infected animals have been found on 23 of these and infection rates have been as high as 33 per cent on some of the farms. On the other hand, no infected rats have been found among 611 caught on 33 farms in the same area.

On one farm no infected rats have been found although 123 have been collected. Among 70 rats shot in a city dump, no histoplasmosis was observed. It is not known whether the sampling was adequate and no infected rats were actually on these premises, nor whether, if this be true, it is a temporary (perhaps seasonal) freedom from infection or a more or less permanent freedom of certain localities and premises. The

data now available do not indicate any seasonal variation.

Experience in the laboratory and the failure to find *Histoplasma* in animals from certain Virginia and Georgia farms, from Baltimore and from Texas, add emphasis to three important considerations in a search for histoplasmosis in animals. One is the necessity for obtaining clean cultures. Contamination of tissues and cultures by either bacteria or fungi usually inhibits the growth of *Histoplasma*. Therefore, it is desirable to bring animals alive to the laboratory, perform the autopsy and make cultures with sterile precautions and make at least five or six cultures from each animal. In the case of rats collected in Virginia, where our experience has been most extensive, cultures from liver and spleen have been most productive.

A second conclusion which seems justified is that among wild animals so far examined in adequate numbers, the rat and the spotted skunk are frequently infected and are, therefore, suitable animals for examination in searching for an animal reservoir of histoplasmosis. Among domestic animals, the cat has been found to be an important host, perhaps because many farm cats catch and eat rats.

A third observation has been that the local distribution of infected rats appears to be quite variable. Further studies may show whether the distribution of *Histoplasma* in nature actually does vary widely and permanently or whether the observations so far made are based on inadequate samples.

The isolation of *H. capsulatum* has been reported from two samples of soil [6] taken from a farm where infected rats had been caught previously. Macroconidia of this fungus were actually demonstrated in the sample after its concentration by flotation. This observation proved conclusively that *H. capsulatum* has a free-living saprophytic existence in soil. Since this observation was reported, *Histoplasma* has been found in 4 additional soil samples by inoculating mice with suspensions of soil. Unlike the first two, these samples had a high organic content. No conclusion concerning the frequency with which *Histoplasma* grows saprophytically in soil nor the conditions necessary for its growth in this natural medium can be drawn at the present time. More than 400 soil samples have been tested. Although we do not know the relationship to human histoplasmosis of the occurrence of the disease in animals and the saprophytic existence of *Histoplasma* in soil, it must be concluded that these phenomena are significant in the epidemiology of the human disease.

SUMMARY

H. capsulatum has been isolated in culture in our investigations from 5 dogs, 1 house mouse, 47 brown rats, 4 roof rats, 19 domestic cats, 7 spotted skunks, and 1 opossum, and from 6 soil samples collected on farms where rats with naturally acquired histoplasmosis have been captured previously.

The significance of these observations is not fully apparent but the examination of cats and rats by preparation of cultures is recommended as a method of determining the geographic distribution of histoplasmosis.

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News of the Pennsylvania Study

News of various activities following up the Pennsylvania State Health Survey have come to hand as follows:

The Pennsylvania Tuberculosis and Health Society is preparing, in coöperation with the Pennsylvania Citizens' Association and the Commission on Preventive Medicine and Public Health of the Pennsylvania State Medical Society, a "brief highlight pamphlet" digesting the 338 page state public health survey report by the American Public Health Association. Entitled "Keystones for Public Health in Pennsylvania," the report was digested in the February, 1949, *Commonwealth* (*A.J.P.H.* July, 1949, p. 959). The new pamphlet will be a digest of a digest designed so that the "busy citizen can get the gist of the story in one sitting." Orders for copies are being accepted by the Tuberculosis Society at 311 S. Juniper St., Philadelphia.

At its 58th annual conference in Reading, May 23–26, the State Tuberculosis Society will conduct a half day workshop on ways and means of making known the facts about the survey. Also, at the request of numerous agencies and individuals in Pennsylvania, PCA is reprinting a second edition of 1,000 copies of the state study.

A state health council has been organized, representative of about 50 voluntary health, professional, and citizen agencies and sponsored by the State Medical Society. The first project it has been requested to undertake is more widespread publicity on the state study and its recommendations.

A state-wide citizens' public health committee is holding a series of seven regional meetings covering the entire state. These are working conferences to study the report of the state survey and to develop strategy for citizen action on the recommendations.

The Pennsylvania League of Women Voters has put the state health survey as an item on its program for the current year. Local chapters are studying the report in preparation for deciding what the legislative stand of the State League with respect to the study should be.

Two voluntary visiting nurse services of Luzerne County have merged in line with recommendations of the Luzerne County section of the state survey.

Panel Discussion on Purification of Biologic Products*

Convened by Geoffrey Edsall, M.D., Boston University School of Medicine, Boston, Mass.

Problems Encountered in the Purification of Toxoids

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THE fundamental problem of toxoid purification *for clinical purposes* is the characterization and immunological evaluation of both the toxoid and non-toxoid proteins present in crude filtrates and the development of methods for the removal of non-toxoid reaction-producing substances. If the non-toxoid proteins responsible for clinical reactions could be defined, the immunochemist would be in a vastly superior position to provide clinically desirable toxoids by simpler methods, perhaps without the necessity of preparing chemically and physically pure toxoid. The approach adopted in our laboratory has been to prepare pure material by means of rather laborious five- or six-step processes, to prepare toxoids of 60 to 80 per cent purity by simpler two- or three-step methods, and to await the results of clinical trials comparing incidence of reactions with such preparations.

Diphtheria toxoid has been highly purified by Pillemer and his colleagues using the five-variable methanol-water system, and by Levine and Edsall with ammonium sulfate fractionation. Additional procedures have also been devised by other workers. Regardless of the method involved, the composition of the crude toxoid will affect the purification process. Successful, reproducible fractionations cannot be carried out when the starting system is of variable composition. This is often the essence of the problem in dealing with the purification of bacterial protein systems.

Some of the factors affecting the composition of the crude toxoid are: the strain of organism used, the medium on which it is grown, the duration of the growth period, the condition of toxoiding and the age of the crude toxoid at the time purification is started.

The most important factor appears to be the composition of the medium. Several considerations enter here: the solubility of the medium components under the conditions of fractionation, the types of salts present and the total ionic strength contributed, and the type and concentration of amino acids, peptides, and proteins present.

The strain of organism used for toxin production may vary with, or depend on, the medium. Regardless of the strain chosen, the schedule of subculturing, the subculture medium, and the age and size of the inoculum should be kept constant, and routine checks made for possible mutations.

The duration of the growth period is important, in that it will be a factor in

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determining not only the total protein concentration of the crude toxin but may also affect the ratio of toxin to other bacterial proteins. Within limits, the longer the growth period, the greater the toxin production; concurrently, however, the greater may be the appearance of other proteins.

Alteration of protein solubility may occur during toxoiding and aging by spontaneous precipitation of salts; as a result of protein-ion, protein-formaldehyde, and protein-protein interactions; and possibly as a result of protein denaturation.

The methanol method for the purification of diphtheria toxoid was developed with an enzymatic casein-digest medium. Toxoids prepared from casein hydrolysate, veal infusion and hog stomach autolysate media have been found to behave quite differently under the same fractionation conditions. Each medium, therefore, presents its own purification problem.

We have also observed the adverse effects on fractionation of changing the growth period and varying the age of the toxoid before processing. Thus, diphtheria toxoid grown for 8 days instead of 5 on the enzymatic casein digest medium and purified by the methanol method yielded an initial fraction containing three times the normal amount of solids but only about 10 per cent additional toxoid. One of the factors involved in crude toxoid changes due to aging has been found to be the spontaneous precipitation of magnesium ammonium phosphate when toxoid is stored. This results in gradual alteration of protein solubility due to changes in ionic strength and the type of ions present.

Three precautions might be mentioned in connection with determining the purity of toxoid fractions. Care should be exercised in the interpretation of flocculation tests where more than one flocculating zone may be present. The evaluation of toxoid electrophoresis diagrams should be qualified by the fact that both diphtheria and tetanus toxoids give symmetrical single peaks between 50 and 100 per cent purity when run at pH 8.6, 0.1 ionic strength barbiturate buffer. Finally, the calculation of L_f/mg. N should be based on non-dialyzable nitrogen and not on trichloracetic acid precipitates.

Reactions in Adults Following the Use of Purified Diphtheria Toxoid

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THE reactions which frequently occur following administration of immunizing doses of diphtheria toxoid in adults resemble closely reactions following injection of relatively large amounts of tuberculoprotein into tuberculous individuals. Very much smaller quantities of crude diphtheria toxoid (or heated Schick toxin control) elicit delayed skin reactions of the tuberculin type. It seems well established that this type of bacterial hypersensitivity results from infection (either clinical or inapparent) and is not brought about by ordinary active immunization with diphtheria toxoid. It has been assumed by many that sensitivity to crude diphtheria toxoid is directed mainly against diphtherial proteins, other than toxoid itself, which are present in the crude formalinized culture filtrate. If this were indeed the case, undesirable reactions could be largely eliminated by the use of purified toxoid.

In order to find out more about the nature of the allergenic substances present in crude diphtheria toxoid, a study was made in collaboration with Dr. H.

S. Lawrence on reactions to certain protein fractions excreted by the diphtheria bacillus. Instead of using heated toxin as Schick control, the following two control materials were used in Schick testing 186 medical students and nurses: (a) Formalinized atoxic proteins (P-proteins) diluted to Schick strength. The toxoid content of this material was less than 0.03 per cent of the total bacterial protein; (b) Highly purified toxoid, containing less than 6 per cent P-proteins, diluted to Schick strength.

The results indicated that very few Schick-positive individuals show reactions to either P-fraction or purified toxoid diluted to Schick strength. However, a high percentage of the Schick-positive group showed some allergic reaction to an intradermal injection of P-fraction at a concentration equivalent to undiluted crude toxoid. Very few showed reactions to undiluted purified toxoid. On the other hand, about 44 per cent of the Schick-negative subjects showed some allergic reaction to the control materials. Most of these pseudo-reactors were sensitive to both purified toxoid and P-proteins, but a small number were primarily sensitive to P-proteins. In addition, there was a small group sensitive mainly to toxoid protein itself.

It was concluded from the above study that if purified toxoid were administered to an adult population without preliminary screening of sensitive individuals, (1) a few individuals would show far less reaction than that expected from the same amount of crude toxoid, and (2) most sensitive persons would either experience fully as severe a reaction as with crude toxoid, or a reaction of somewhat diminished severity because of removal of P-proteins.

At the request of the Armed Forces Epidemiological Board, a study was made during the summer of 1949 of reactions following injection of crude and purified toxoids in 2,712 officers and men at Fort Knox, Kentucky.* All men were Schick-tested and received a simultaneous subcutaneous injection of exactly 5 L_f of one of the following lots of toxoid: (a) crude toxoid from toxin produced on casein hydrolysate medium; (b) crude commercial toxoid from toxin produced on tryptic digest medium; (c) toxoid of 73 per cent purity fractionated with ammonium sulfate; (d) toxoid of 95 per cent purity isolated by methanol fractionation; and (e) toxoid of 93 per cent purity isolated by ammonium sulfate fractionation.

Very few untoward reactions occurred among those individuals (40.3 per cent) who were Schick-positive. The few severe local or systemic reactions which did occur were all among the group of so-called "combined" reactors, i.e., individuals who showed an allergic reaction to both Schick-toxin and control at 48 hours but gave a typical Schick-positive reaction when seen on the 4th to 6th day. In the Schick-negative population, there was a significant reduction in the number of untoward local and systemic reactions among those groups which received purified material. There was an approximate correlation between the degree of purification and the reduction in incidence of undesirable reactions. Certain highly sensitive subjects (as evidenced by severity of intradermal reaction to crude Schick control) derived striking benefit from the injection of highly purified toxoid in that local and systemic reactions were mild or negligible. There was no significant difference in the relative number of such individuals among the group who received methanol fractionated toxoid (95 per cent) as compared with the group who received ammonium-sulfate purified toxoid (93 per cent). When

* This study was carried out by Drs. H. J. Banton and Geoffrey Edsall of the Antitoxin and Vaccine Laboratory, Massachusetts Department of Public Health, and Drs. H. S. Lawrence and A. M. Pappenheimer, Jr., of New York University College of Medicine.

severe local or systemic reactions did occur following administration of highly purified toxoid, they were fully as severe as those observed following injection of crude toxoid, regardless of the method of purification. An unexpected finding was that the benefit derived through the use of purified toxoid decreased with age. Thus, local reactions to crude toxoid were nearly 7 times as frequent as reactions to highly purified toxoid among subjects under 20 years of age. On the other hand, there were nearly as many reactions to highly purified toxoid as there were to crude among men over 30. More than 5 times as many individuals of 35 years and older showed local reactions to highly purified toxoid than was the case with men under 20. By contrast, the frequency of local reactions to crude toxoid showed no significant variation with age, although the severity of the reactions tended to be greater in the older age groups.

Purification of Brain Tissue Vaccines—General Considerations

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IN the past, virus vaccines of necessity have contained tissue components, since infected tissues are the only sources of antigen, and purification methods have not been very practical or efficient. With the introduction of chick embryos as a source of certain virus antigens using infected allantoic fluids, the relative amount of tissue components was reduced and the starting material lent itself better to chemical and physical methods of purification and concentration. However, only certain viruses can be produced in high titers in chick-embryo allantoic fluids so that infected animal tissues as such are still the only source of large amounts of many viruses—such is the case in preparing rabies vaccine from infected animal brains.

The presence of tissue in the final virus vaccine product makes it just as available as an antigen as the virus component itself, and the degree of response of the human being to this tissue antigen depends upon the antigenicity of the tissue factor, the quantity inoculated, and the ability of the recipient to be sensitized, or his past experience with the particular tissue antigen.

The response to tissue components of virus vaccines varies from the immediate reaction in those previously sensitized, to the development of a specific sensitivity as the result of immunization. The immediate anaphylactic type of reaction in people sensitive to egg components on receiving chick embryo vaccine is of course an obvious and dramatic example of the former, and the development of sensitivity to rabbit brain after a course of rabies vaccine illustrates the second type of response. We have had the experience of being called upon for advice in the case of a veterinarian who had been exposed to rabies 15 years previously and been given a course of rabies vaccine at that time without any difficulty. When again exposed to rabies the very first dose of vaccine caused an immediate severe generalized reaction. Since the exposure to rabies had been definite there was a need for vaccine, so we advised the use of canine type vaccine produced from sheep brain in place of the human rabies vaccine made from rabbit brain. This was successful and a full course of sheep brain vaccine was tolerated without any evidence of sensitivity. However, about a year later we heard from

the veterinarian that, since his receiving the second course of vaccine, every time he ate lamb he developed hives.

The occurrence of CNS symptoms following virus vaccines has been a clinical reaction difficult to interpret on the basis of sensitivity, since the same type of demyelinating encephalitis occurs after smallpox immunization, rabies vaccine and following certain virus infections such as measles. The possibility of an allergic phenomenon being involved is of course most obvious in the encephalomyelitis following a course of rabies vaccine. Here relatively large amounts of crude rabbit brain emulsion are injected repeatedly over a period of 2 to 3 weeks. Practically all patients receiving such a rabies vaccine series develop evidence of skin sensitivity to the brain material by the end of the first week when not only the site of the current injection becomes indurated, red and painful, but all the sites of previous doses also flare up. Reactions manifested by CNS symptoms also usually appear in the latter part of a course of rabies vaccine and are often accompanied by manifestations of allergic response such as fever, nausea, urticaria, lymphadenopathy. The incidence of these so-called paralytic accidents averages about 1 in 3,000 to 5,000 rabies immunizations, but in some areas such as in Los Angeles County, it has been reported to occur as frequently as 1 in 600. Reporting of these cases has not been very efficient in the past, but it is safely estimated that at this time there are more reactions of this type than there are cases of rabies in human beings in this country each year.

Attempts to purify rabies vaccine and remove its capacity to produce encephalitis have been impractical in the past because of our inability to produce the corresponding entity in experimental animals. In the last two years, such an experimental technic has become available and there is reason to think that the encephalitis produced in animals parallels that occurring in man after rabies vaccine administration.

Using this experimental procedure in guinea pigs, Dr. J. F. Bell of our laboratories has been able to extract rabies vaccine in such a way that the antirabies antigenicity is preserved but the factor responsible for producing the allergic encephalitis in animals has been removed. The method is dependent upon the fact that after removal of lipids from dehydrated brain antigen by benzene-ether extraction, virus antigen is insoluble in the presence of M/10 calcium acetate whereas the encephalitic factor is soluble and can be washed out of the vaccine.

Commercial producers of rabies vaccines have been informed of this experimental procedure and are now attempting to see if it is applicable to large volume production. The final answer as to whether this will solve the problem of post rabies-vaccine encephalitis in human beings will probably not be forthcoming until widespread use of extracted vaccines has been in practice for several years.

Purification of Rabies Vaccine—Immunological Considerations

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THIS discussion is concerned with evidence indicating that the test used for the purification of rabies vaccine to exclude the factor causing human paralytic accidents is an adequate one.

Injection of rabbit brain rabies vac-

cine, emulsified in a water-in-oil emulsion containing killed mycobacteria, into the subcutaneous tissue of guinea pigs, produces allergic encephalomyelitis. This experimental disease is very similar to the paralytic accident. In the guinea pig, the period between the injection of vaccine with adjuvant and the appearance of symptoms varies, as a rule, between 2 and 3 weeks. The signs are, in order of their frequency, paresis or paralysis of the hind legs, urinary incontinence, paralysis of the sphincter of the rectum, excitement, nystagmus, strabism, tremor of extremities or the whole body, ataxia, paresis of the front legs. Remissions or, rarely, recovery may occur. The histopathological lesions are confined to the central nervous system. They occur in a disseminated form throughout, though more prevalent in the white matter. Focal meningitis is always present. The blood vessels, mainly small veins, show inflammatory changes. They are surrounded by inflammatory cells mainly monocytes and lymphocytes; the walls of the venules may be affected; thrombosis can be seen. Here and there, inflammatory cells spread from the immediate vicinity of the venules into the parenchyma. Many of the neurons are affected and in turn may be surrounded by the phagocytic cells of the central nervous system. Perivascular demyelination is frequent.

Paralytic accident appears, usually in about 2 to 3 weeks after the first injection of vaccine. This protean disease may be divided into three types. The most frequent type is characterized by motor nerve paralysis or paresis of one or a few nerves (facial palsy, or paralysis of an arm, etc.) almost always followed by recovery. Persons with the dorso-lumbar type suffer from the involvement of the nerves controlling the sphincters of the bladder and rectum and may develop paresis of the legs. There is 5 per cent mortality in this group and the survivors may or may not recover completely. The third type is a form of Landry's ascending paralysis. It may begin like the lumbo-dorsal type but progresses to involve the upper extremities and may end as the bulbar paralysis seen in poliomyelitis. There is a 30 per cent mortality but the survivors often recover completely in a very short time. The histological lesions in the dorso-lumbar and the ascending types are similar to those seen in guinea pigs dying of allergic encephalitis. Inflammatory cells about venules and perivascular demyelination are conspicuous.

Allergic encephalomyelitis can be induced in the guinea pig with central nervous system tissue from the guinea pig or rabbit, horse, and man. The explanation of this seeming lack of species specificity lies in the fact that the central nervous system contains organ-specific in addition to species-specific antigens.

Does the application of adjuvants introduce into the test an aspect that makes the sensitization of guinea pigs different in kind from that occurring in man in the course of antirabies vaccination? Before the use of adjuvants experimental allergic encephalomyelitis could be produced only by from 30 to 100 injections of brain substance. The clinical symptoms and histological lesion were nevertheless almost identical with those seen when adjuvants are employed.

The final proof for the validity of the guinea pig test and, of course, the method of purification will be given by experience with human vaccination.

Inactivation of Viruses in Blood and Blood Products

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As the distribution of blood and its derivatives has become more widespread, preventing the simultaneous distribution of infectious contaminants has become more urgent. This seems particularly difficult to deal with where the infectious agent is a virus sharing many properties in common with the proteins of the blood. In general, the contamination of a protein solution by bacteria, or their products of a pyrogenic or toxic nature, has been successfully prevented by appropriate safeguards introduced during collection, processing, and testing of the protein preparations. It can be fairly well demonstrated that in these cases irreversible alteration of blood proteins need not occur.

Where we desire to insure the absence of a virus from a protein product we should then move along the same path. In the case of the infectious agent for homologous serum jaundice we wish to consider for purposes of discussion what can be done by processing procedures alone to make certain that the virus will not be in the final product when neither the collecting nor the testing methods are adequate to insure its absence.

Two possible procedures are open for the elimination of such a contaminant:

1. Separation by fractionation
2. Removal by differential denaturation

Boyd and Enders carried out experiments in 1944 on the fractionation of blood plasma inoculated with various laboratory virus strains. Preliminary results indicated a detectable concentration of virus in every fraction separated. Presumably methods could be developed for such separations where extensive determination of virus concentration could be made but at the present time such a procedure is not available for the virus of homologous serum jaundice. It seems reasonable to assume that a method which reduces the virus concentration by a factor of more than 1,000 in the final products would be necessary. It is worth noting that limited follow-up studies of people who received human albumin and globulin from pooled plasma failed to reveal evidence of virus transmission, even where no specific methods were used to insure the absence of the virus; while on the other hand Fraction I, the fibrinogen-rich fraction of human plasma, has been shown to transmit the virus with an incidence similar to that of the plasma from which it was derived.

For differential denaturation four procedures have been proposed:

1. Heat
2. X-rays and cathode rays
3. Chemical alkylating agents
4. Ultra-violet radiation

Heat has been used by Gellis, *et al.* (*Journal of Clinical Investigation* 27: 239, 1949) for the inactivation of live virus added to human serum albumin. It was found that heating for 10 hours at 60°C. was adequate to eliminate virus activity and that such treatment reduced the thermal stability of the albumin by about 10 per cent without other detectable changes. This step has been adopted as a routine procedure in the preparation of albumin solutions for transfusion. In principle, it can be applied to other separated proteins, but the stabilizers which prevent thermal denaturation of a separated protein are rather specifically selected for each protein and frequently the reagent that is a stabilizer for one protein reduces the thermal stability of another protein. Therefore it seems unlikely that a stabilizer can be formed which

will simultaneously protect all the components of a complex protein mixture such as plasma.

X-rays and electron beams have been proposed as agents for the destruction of a virus in plasma. Some preliminary work has been done with 2,000,000 volt electrons. The reason for suggesting such a form of radiation is its great penetrating power (up to 1 cm. in dilute aqueous solutions) and the fact that experiments with bacteria suggest that the killing power is proportional to the volume of the particle. Assuming the virus in question to be considerably larger than the plasma protein molecules one might hope for a differential effect. Experiments with albumin and γ-globulin have been carried out for the American National Red Cross under the direction of Dr. Dwight J. Mulford at the Massachusetts State Biologic Laboratory, and in collaboration with Dr. Trump and his group at the High Voltage Laboratory at the Massachusetts Institute of Technology. Results indicate a considerable destructive effect on human serum albumin and human γ-globulin as judged by decrease in thermal stability in the same range where bacterial destruction occurs. No demonstration has been made of the effect on homologous serum jaundice virus.

The use of chemical agents for virus destruction comes from the suggestion made by Drs. Hartman and Mangun that nitrogen mustard, N-methyl-bis-(β-chloroethyl)-amine, could be used to inactivate viruses and bacteria in the presence of other proteins. They have shown this to be true of a number of laboratory strains of viruses and bacteria both in plasma and blood. Experiments with albumin indicate that this agent decreases the thermal stability of albumin although not by a large amount compared to ultra-violet or cathode rays. It rather readily inactivates prothrombin and accelerator globulin. No demonstration has been made of its effect on homologous serum jaundice virus. Other alkylating agents are being studied. Certainly the simplicity of the use of a chemical reagent cannot be overlooked, if it can be shown that its reaction products can be either readily removed or can be safely administered to human beings.

That ultra-violet radiation will inactivate the virus for homologous serum jaundice in human plasma has been demonstrated by Oliphant and by Stokes. The nature of the effect on the plasma proteins is difficult to demonstrate. For the amounts of energy used, all the evidence indicates that there is no gross degradation of the plasma proteins. Solutions of human albumin do not change in turbidity or in the sedimentation characteristics of the albumin molecule following treatment. However, here too the thermal stability of albumin is markedly decreased when the separated protein is irradiated while preliminary evidence suggests that the irradiation of plasma produces a similar effect on the albumin.

Since the methods most seriously discussed for inactivating the jaundice virus in blood or its derivatives do undoubtedly lead to changes in all the proteins in the system it is important that clinical studies be designed to demonstrate the significance of those changes. Since the changes seem to be subtle ones, this perhaps makes the problem more difficult.

General Discussion

REFERRING to Mr. Lepow's paper, Dr. M. H. Jacobs, New York City, pointed out that the alcohol methods required equipment and utilities which

were expensive and in some parts of the world unobtainable, and that simpler methods for purification were available and should be given full attention.

Dr. J. T. Tripp, Lansing, Mich., called attention to the limitations of flocculation methods for selecting satisfactory batches of toxoid, noting that he had seen batches which were fully antigenic but which would not flocculate.

In reference to Dr. Strong's paper, Dr. Bettylee Hampil, Glenolden, Pa., stated that, in exploring the properties of the Habel-Sockrider ultra-violet irradiation apparatus, she and her associates had found that certain viruses (e.g., influenza, rabies) were easily inactivated, whereas others (e.g., Eastern and Western equine encephalomyelitis) were highly resistant. A clinical study, carried out to determine the efficacy of ultra-violet irradiation in inactivation of the virus of homologous serum hepatitis, had indicated that this technique was highly effective, no hepatitis occurring in subjects receiving the irradiated material whereas 25 per cent of the controls got frank jaundice and 60 per cent had signs of hepatitis.

The *Aerobacter aerogenes* sterilization test, set up by the National Institutes of Health as a control standard for irradiation equipment, had been found by Dr. Hampil and her colleagues to give a wide margin of safety.

Dr. Tripp remarked that the complexity of any study on homologous serum hepatitis precluded any clinical extensive experiments unless thoroughly justified; hence, ultra-violet irradiation, now quite well established as a satisfactory technique, should not be replaced by any other technique unless very forceful arguments for such a change should arise. He noted that, whereas sufficient ultra-violet irradiation to kill 5×10^7 *A. aerogenes* per ml. was also sufficient to cause damage to plasma, the standard range ($1\text{–}10 \times 10^6$ organisms per ml.) only rarely caused detectable damage; although a definite change in the stability of plasma lipids had been observed, no important changes had been noted.

As regards equipment, it was emphasized that regardless of the type employed, an essential feature of all operating systems was to place the flowing liquid between its suspending surface and the ultra-violet source, in order to avoid the formation of a layer of denatured protein between the flowing material and the incident light.

Dr. Robert Pennell, Glenolden, Pa., called attention to the contrasting merits and demerits of ultra-violet light and the nitrogen mustards studied so far, as regards physical changes induced in plasma proteins; whereas ultra-violet light caused measurable decrease in the heat stability of plasma proteins but little or no detectable destruction of complement, nitrogen mustard had just the opposite effects.

Dr. M. V. Veldee, Los Angeles, Calif., observed that no ultra-violet irradiation apparatus was easy to make or simple to operate. He asked Dr. Strong (1) whether there was any evidence of harm resulting from irradiation in the 10,000 instances to date in which irradiated plasma had been used, and (2) whether albumin was perhaps more difficult to irradiate without damage than was plasma. Dr. Strong replied that he did not know, in either case. He added that the stability studies on albumin had been complicated by the unexpected finding that d-l-tryptophane, the standard stabilizer for this product, had been found to enhance the denaturing effect of ultra-violet light.

Dr. Tripp and Dr. Veldee closed the discussion with the suggestion that the stability test technique and requirement for albumin be considered for revision, since they had been drafted to allow for the rigors of wartime handling of this product, such as were no longer of practical consequence in its peacetime use

Influence of Particle Size upon the Retention of Particulate Matter in the Human Lung*†

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THE fraction of an inhaled dust which is retained in the respiratory system and the depth to which the dust penetrates before deposition are sensitively related to its particle size.‡ Thus, the size factor is a primary one in determining the magnitude of hazard associated with the inhalation of particulate matter. Specifically, in the case of silicosis and other pulmonary dust diseases, interest is limited to that portion of the total inhaled material which is deposited in the alveoli. In order, therefore, to relate levels of atmospheric exposure for different size particles to actual pulmonary dosages, a quantitative relationship is required between size and the amount of dust so deposited. Results from the several previous investigations of this relationship are summarized in the following sections.

The earliest measurements of total retention in the respiratory system (without reference to site of deposition) demonstrated that percentage retention decreases with particle size[1-3] from nearly 100 per cent for mineral particles larger than 5 microns down to about 25 per cent for ¼ μ particles, at the limit of microscopic measurement.[4] A lower retention occurs with mouth breathing than with nasal breathing. Direct measurements of nasal filtering efficiency have shown that it also decreases with particle size.[5-7] From 100 per cent for above 5 to 10 μ, it drops systematically to zero for particles of the order of 1 μ. Thus, the high overall retention for 5 μ particles is entirely accounted for by efficient removal in the nasal chamber and it follows that penetration to the alveoli is negligible for particles of this size. Below 1 μ, on the other hand, all of the retention takes place beyond the nose; and such particles, therefore, are of greater physiologic interest than coarse particles which exhibit higher total retention values.

From physical and mathematical considerations (assuming a simplified respiratory pattern and average dimensions of air passages), Findeisen[8] calculated the depth of penetration and percentage removal in relation to particle size for the respiratory system beyond the nasal chamber, i.e., from the trachea to alveoli and return. His analysis shows, in accordance with expectations, that depth of penetration increases with decreasing size. Efficiency of removal at any site, however, decreases as size is reduced. With these

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† The work described in this paper was done under contract between the Biological Division, Chemical Corps, U. S. Army, and the Mellon Institute (Industrial Hygiene Foundation Research Laboratory).

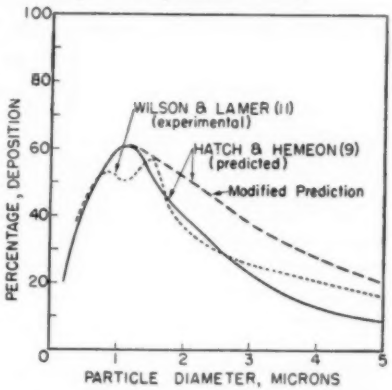
‡ Size is used here to include shape, density and other physical factors which affect the dynamic properties of particulate matter.

two factors in opposition, it follows that there must be an optimum size for maximum alveolar deposition, with lower values above and below, because of earlier trapping of larger particles and decreasing efficiency of removal of finer particles in the alveoli themselves. The size-range for greatest alveolar deposition is around 1–2 μ, according to Findeisen's calculations; which also show that, for finer particles, alveolar deposition decreases to a minimum at about ¼ μ, and then increases again with further decrease in size, as the magnitude of Brownian movement increases.

Starting with the experimental data on the variation in total retention with size reported by Van Wijk and Patterson,[4] Hatch and Hemeon[9] derived the relationship between alveolar deposition and size shown in Figure 1. The construction of this curve is based on certain assumptions in addition to the experimental data on overall retention: (a) one-way upper respiratory retention during inhalation; (b) lung ventilation two-thirds of tidal volume; (c) theoretical calculation of alveolar deposition based upon law of simple sedimentation. The assumption of one-way nasal retention is obviously incorrect. Tourangeau and Drinker[10] found equal nasal efficiencies in both directions of air flow through the nasal chamber. With this change in the assumed upper respiratory retention, the modified curve in Figure 1 results. In agreement with Findeisen's calculations, these curves suggest that maximum alveolar deposition occurs with particles about 1 μ in size.

Direct measurements of the variation in deep-lung deposition with particle size have been reported by Wilson and LaMer.[11] These investigators used radioactive particles of approximately unit density and controlled size. The amount of material deposited in the alveoli and in the lower air passages was measured by direct activity counts

FIGURE 1—Relationship between percentage alveolar deposition of inhaled dust and particle size (comparison of predicted relationship with experimental data).



on the chest. Their curve for mouth breathing is also reproduced in Figure 1.* It is in substantial agreement with the others in general shape, and in respect to the size with greatest probability of deposition in the alveoli. The higher peak in the bimodal curve may be explained by the reasonable assumption that maximum deposition in the air passages above the alveoli (included in the measurements) occurs with a larger particle size than in the alveoli.

Landahl and Herrmann[7] demonstrated a curve of similar shape for lung deposition which was obtained as the product of separately determined values of nasal penetration and total retention by mouth breathing for particles of different sizes. Their data show an optimum size for deep-lung deposition varying with particle density and breathing rate from about one-half μ to 3 μ.

Overall retention increases with decreasing respiration frequency[3] and nasal efficiency decreases with increasing rate of air flow through the nasal chamber.[5] In other words, the depth of

* Relative retention scale changed to percentages by us.

penetration and distribution as well as the amount of dust retained in various parts of the respiratory system vary with the respiratory pattern. The effect of changes in the breathing characteristics, however, differs for particles of different sizes. For example, upper respiratory retention for particles smaller than 1 μ is practically zero, regardless of the breathing rate. Therefore, all such particles that are retained will be deposited in the alveoli and the higher retention value with low breathing frequency represents, in this case, no change in distribution but simply greater alveolar deposition, resulting from the longer sedimentation time. Similarly, the high nasal retention for coarse particles persists over a wide range of air flow rates and, as a consequence, few of these particles are ever deposited in the alveoli whatever the respiratory pattern may be. Thus, it is in the size range from 1 to about 5 μ where differences in breathing pattern changes both the site of deposition and the retention. Here, a decrease in frequency of breathing permits greater penetration through the nasal chamber and consequently a greater proportionate increase in alveolar deposition than in overall retention.

In summary, the theoretical and experimental findings to date permit the following conclusions:

1. Overall respiratory retention is essentially complete for particles above 5 μ. It decreases with size to a minimum of about 25 per cent for approximately $\frac{1}{4}$ μ particles and then increases again for submicroscopic particles.
2. Nasal efficiency is also practically 100 per cent for particles larger than 5 μ and decreases systematically with size, reaching zero, however, for particles of finite size of about 1 μ.
3. Depth of penetration before deposition increases with decreasing size. For those particles larger than 1 μ which escape trapping in the upper respiratory tract, alveolar retention is complete. Smaller particles are retained in decreasing amounts but, however small the retention may be, practically all deposition takes place in the alveoli.
4. Thus, there is an optimum particle size having the highest probability of alveolar deposition. This is about 1 μ. Smaller particles, down to $\frac{1}{4}$ μ, have approximately the same probability of being retained in the alveoli as those from 1 to 5 μ. Sub-microscopic particles are deposited in the alveoli in increasing amounts as size is further reduced and, theoretically, retention approaches a maximum value corresponding to the percentage of tidal air which reaches the alveoli.
5. The relationship between particle size and penetration, and deposition of dust changes with the respiratory pattern. Retention increases with decreasing respiratory frequency. The effect is greatest for particles betwen 1 and 5 μ for which there is a much greater proportionate increase in alveolar deposition than in the overall retention as breathing rate decreases. The respiratory pattern has no significant effect upon the site of deposition of particles smaller than 1 μ.

The foregoing conclusions are based only in part on experimental data. Further research, particularly to check the theoretical calculations and conclusions, is therefore needed. This was the purpose of the present study.

DESIGN OF EXPERIMENTAL PROCEDURE

Measurement of alveolar deposition of inhaled dust in human lungs is, necessarily, an indirect procedure which involves certain assumptions. An experimental technique is required which introduces minimum error from such assumptions. In the present study, retention was calculated from direct measurements of the amount of dust returning from the respiratory system in the exhaled air, as in the standard procedure for measuring total retention.

Each exhalation, however, was separated serially into several fractions, representing air from the upper respiratory tract, mid-portion and alveoli, and the amount of dust determined in each. The carbon dioxide content of each fraction of exhaled air was also determined for comparison with the alveolar CO_2, measured at the beginning and end of the test. Thus, it was possible to calculate the portion of true lung air in each fraction and, by a procedure to be described later, the outgoing concentrations of dust in upper respiratory air, C_u, and in lung air, C_L, could be determined from the measured concentrations.

From these two values and the intake concentration, C_o, the total retention, R, one way * upper respiratory retention, U_1, total retention from upper respiratory air, U, and alveolar retention, A, are calculated by the following equations †:

$$R = 1 - \frac{(1-K)\,C_u + KC_L}{C_o} = 1 - \frac{C_t}{C_o}$$

where K = ratio of lung ventilation to tidal volume

C_t = dust concentration in total exhaled air

$$U = 1 - \frac{C_u}{C_o};\quad U_1 = 1 - \sqrt{1-U}$$

$$A = 1 - \frac{C_L}{C_u}\ \text{(in terms of amount of dust reaching alveoli)}$$

From these relationships, the following are derived:

1. Total deposition in upper respiratory tract:
   $U_t = U + KA\,(1 - U - \sqrt{1-U})$
2. Fraction of inhaled particles penetrating to alveoli:
   $P = K\sqrt{1-U}$
3. Deposition in alveoli:
   $A \times P = KA\sqrt{1-U}$
4. Total respiratory retention:
   $R = U_t + AP = U + KA\,(1-U) = 1 - \frac{(1-K)\,C_u + KC_L}{C_o}$

Apparatus

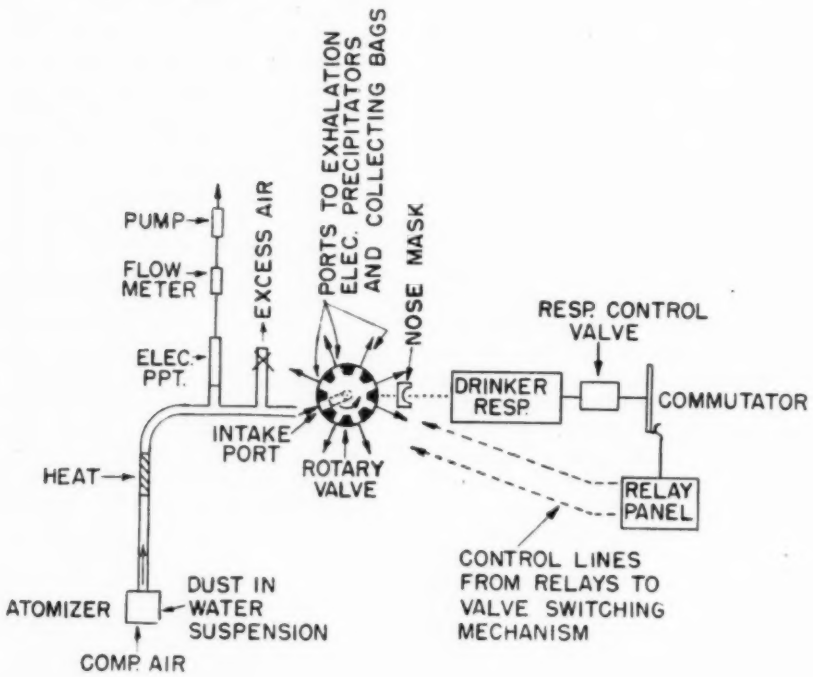
The test equipment is illustrated diagrammatically in Figure 2. The essential device in the system is a rotary valve connected through a central port to the face mask. Rotation of the valve successively opens eight ports around the periphery of the valve. One of these ports is connected directly to an atomizer which serves both as an air supply and as a means of dispersing the dust from water suspension into the air stream. The dust-laden air is delivered to the face mask through a heated chimney to insure evaporation of the water droplets. The other seven ports are connected through electric precipitators to vinylite collecting bags. The valve is electrically operated through a relay panel and commutator, which is connected by a direct mechanical drive to a Drinker respirator ‡ in which the subject is placed. The arrangement of the

* Assuming equal efficiencies of removal in both directions.

† All retention values are expressed as decimal fractions rather than percentages.

‡ We are indebted to the Warren Collins Company, Boston, Mass., for the loan of a Drinker respirator for this work.

FIGURE 2—Diagrammatic layout of test apparatus for determination of upper respiratory and alveolar deposition in inhaled dust.



electrical circuits in the relay panel is such that the port to the atomizer is open during inhalation and closed during exhalation. Over the exhalation phase of the cycle the other seven ports are opened consecutively to their respective precipitators and bags. By this means each exhalation is separated serially into seven portions and the mechanical coupling assures that the same portion of the exhalation will be delivered to the same bag on successive cycles of respiration. The commutator contacts may be adjusted to give any desired portioning of the exhalation.

The volume of external dead space introduced by the apparatus is approximately 20 ml. per breath. This low volume was obtained by making all connections of the shortest possible length, using tubing of the smallest size within limits of resistance to breathing and molding a plasticene nose mask to fit the subject closely. The small volume reduces to a minimum the error in the necessary correction for the amount of inhaled dust which is deposited in the exhalation precipitator at the beginning of exhalation.

Partitioning of Exhalation

With this apparatus, satisfactory partitioning of the exhaled air is obtained, as demonstrated by the CO_2 measurements in Table 1. These data were obtained with nasal breathing with the respirator set at 15 RPM and 20 cm. of water, negative pressure. Mouth breathing has not given satisfactory partitioning.

TABLE 1

The partition of expired air into separate fractions. The calculated dead space included the apparatus dead space of 20 ml.

Exp. No.	CO_2 Per cent								Calc. Dead Space		Vol. Breath
	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5	Bag 6	Bag 7	Alveolar	ml.	% T.V.	ml.
24	0.46	0.66	1.16	2.2	3.2	3.3	3.2	4.8	223	28	790
32	0.64	0.81	2.40	2.9	3.2	3.2	3.2	4.8	260	37	695
41	0.31	0.71	2.30	3.1	3.5	3.6	3.6	5.2	262	40	660
42	0.40	0.80	1.50	2.8	3.4	3.3	3.4	5.2	225	36	620
47	0.37	0.88	2.3	2.9	3.5	3.4	3.6	5.1	228	30	770

It will be noted that the CO_2 content rises steadily from a low value in the first bag to an essentially constant level in the last three bags, indicating a progressive increase in the percentage of true lung air (as measured by the alveolar CO_2) in the separate portions from bag No. 1 to Nos. 5–6–7. The percentage CO_2 in alveolar air is somewhat lower than commonly reported and is accounted for by the enforced excess ventilation imposed by the mechanical respirator.

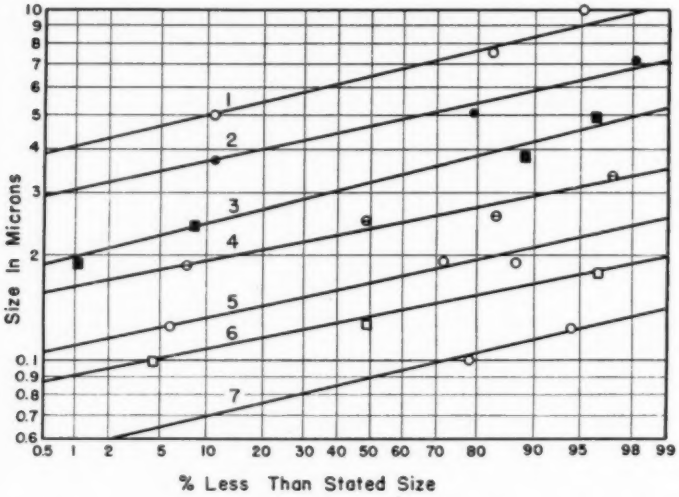
The dead space (anatomical plus external) given in the table, was calculated in the usual manner from the total CO_2 output, the alveolar CO_2 content and the tidal volume. Similarly, the percentages of upper respiratory and lung air in each fraction of exhaled air may be calculated from the CO_2 values. The figures show that a small portion of lung air escapes in the earliest phase of exhalation and that there is a persisting residue of upper respiratory air mixed with the alveolar air from the last fraction collected. Despite the lack of complete partitioning, however, the great differences in these percentages between bags 1–2, 3–4, and 5–6–7 represent real separation. In fact, the results demonstrate that so many fractions are not needed to give adequate partitioning. Consequently, in the latter part of the study the rotary valve was modified to give only three fractions, thus reducing the amount of analytical work.

Preparation and Dispersion of Test Dusts

As the test dust we have used china clay. Size fractions above 1 μ were secured by repeated settling and washing until a high degree of uniformity was secured by microscopic sizing. Smaller fractions were secured by repeated fractionation in an ultracentrifuge until reasonable uniformity was secured, as indicated by electron-microscope photographs. Size distribution of dust in the various fractions is illustrated by the log-probability plots in Figure 3. In use, the fractions are suspended in water at the desired concentration. A dispersing agent is added to minimize aggregation of the particles.

The high-pressure atomizer serves a dual purpose; it furnishes the air for breathing and disperses unitary particles into the air stream. Air is supplied at approximately constant flow in excess of the maximum breathing rate. At the same time, the device lifts and atomizes an approximately constant amount of the water with its suspended dust. The high velocity jet impinges immediately on a plate, resulting in the production of microscopic droplets, most of which contain single particles. Larger droplets are trapped in the curtain of water returning to the reservoir below, or in the column of beads above. The fine droplets which escape are evaporated in the heated section of the chimney, leaving the dry particles in a highly dispersed

FIGURE 3—Log probability plot of dust samples.



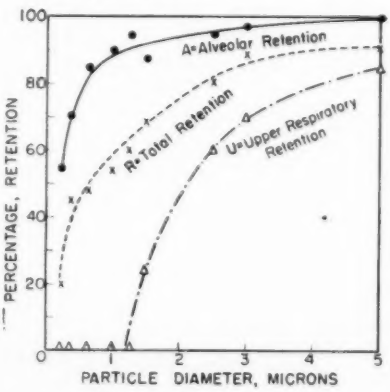
state in the air. Examination of precipitator samples has disclosed satisfactory performance in this regard with only occasional flocs observed.

For the larger sizes (above 3 μ) the impinging action causes some shattering of the particles. The impinging plate was found to be unnecessary for such particles, however, since flocculation is not a problem. Moreover, useful data are obtainable, despite shattering, by making size measurements as well as particle counts of the precipitator samples, thus giving in a single test retention values for different sizes.

Test Procedure

At the beginning of a test, the subject is placed in the respirator and the face mask adjusted. The respirator is set to the predetermined speed and the pressure and the atomizer are turned on to supply air and dust to the subject. During the course of the experiment an electric precipitator samples directly from the input air supply at a measured rate of air flow, for the determination of the inhaled dust concentrations, C_o. At the conclusion of the test period (usually 10 minutes) the electric precipitators are removed and the collected dust washed out for determination of concentration by turbidemetry and by count. Routine thermal precipitator samples are collected during each test and examined for signs of particulate aggregations. The CO_2 content and volume of air in each of the exhalation bags are determined.

FIGURE 4—Summary of experimental determinations of upper respiratory, alveolar, and total retention of inhaled dust in relation to particle size.



The calculations from the collected data are straight-forward, as shown in the following illustrative sample.

Sample Calculations

Experiment No. 43; resp. neg. pres. — 20 cm.; RPM — 15; subject — GN; duration of test 10′–24″. Intake precipitator — vol. sample — 48.2 liters; alveolar CO_2 — 5.2%. Size of test dust — 1 micron.

(1) Analysis of collecting bags:

Bag No.	*Air Vol. Liters*	*% CO_2*	*Liters CO_2*	
1–2	15.0	0.70	0.105	} 0.684 liters ÷ 5.2% = 13.2 liters lung air
3–4	25.7	2.24	0.579	}
5–6–7	56.8	3.83	2.165	÷ 5.2% = 42.0 liters lung air
	97.5			

(2) Partitioning:

Bag No.	*Ext. Dead Space*	*Distribution of Exhaled Air, Liters* *Upper Resp.*	*Lung*	*Total*
1–4	3.1	24.4	13.2	40.7
5–7	—	14.8	42.0	56.8
		39.2	55.2	97.5

Vol./breath = 97.5 ÷ 15 RPM × 10.4′ = 625 ml.; anatomical dead space = 39.2 ÷ 15 × 10.4 = 250 ml.

$$K = \frac{\text{lung vent.}}{\text{T. V.}} = \frac{55.2}{97.5} = 0.57$$

(3) Analysis of dust counts:

Sample	*Total Count x 10^9*		*Sample vol., m^3*	*Conc./m^3 x 10^9*
Intake	9.4		0.048	195 (=C_o)
Bags 1–4	5.9	} 9.6	0.041	143
Bags 5–7	3.7		0.057	64

Calculation of R: Subject inhaled $195 \times 10^9 \times .0975\ m^3 = 19 \times 10^9$ particles
Subject exhaled $9.6 \times 10^9 - 195 \times 10^9 \times 0.0031$ (d.s.)
$= 9 \times 10^9$ particles

$$R = 1 - \frac{9 \times 10^9}{19 \times 10^9} = 53\%$$

Calculation of C_u, C_L, U and A

These are determined from simultaneous equations relating C_u, C_L and their respective air volumes to the total amounts of dust found in the two fractions, thus:

Equation No. 1 $0.024\ C_u + 0.013\ C_L = 5.9 \times 10^9 - 0.6 \times 10^9$ (dead space)

No. 2 $0.015\ C_u + 0.042\ C_L = 3.7 \times 10^9$

Solving for C_L. $0.054\ C_L = 0.6$

$C_L = 11 \times 10^9$

$\therefore \quad C_u = 210 \times 10^9$

Since the calculated value of C_u exceeds C_o it is evident that they are, in fact, alike and it becomes immediately apparent that U = O and $A = 1 - \frac{11 \times 10^9}{195 \times 10^9} = 94\%$.

SUMMARY OF RESULTS

The results from over 100 tests, with median particle size ranging from 0.24 μ to more than 5 μ calculated in the foregoing manner, are summarized graphically in Figure 4. Each point on the graph is the average of at least three separate tests.

In accordance with previous findings and calculations, R is shown to decrease systematically from a value of 90 per cent or more for mineral particles 5 μ and greater in size, down to 25 to 30 per cent for $\frac{1}{4}$ μ particles. Upper respiratory retention, similarly, decreases in an orderly fashion, reaching zero, however, at a finite particle size above 1 μ. Alveolar retention, calculated as a percentage of the number of particles reaching the alveoli, remains between 90 and 100 per cent for all sizes down to about 1 μ, below which it decreases in proportion to R.

From these curves, the percentage of *inhaled* particles deposited in the upper respiratory tract, U_t, and in the alveoli AP, have been calculated and plotted in Figure 5. A value of $K = 0.6$ was used in the calculation, this being the average (0.6 ± 0.08) found in the series of tests.

The AP curve is based upon the assumption that upper respiratory retention is equal in both directions. For comparison, another AP curve (dotted line) is given based upon assumed one-way upper respiratory retention. One represents the maximum and the other the minimum alveolar deposition in relation to particle size. The true relationship lies between these two limits. Both show that, for mineral particles, the optimum size for alveolar deposition is *ca* 1 μ and that, on a ratio basis, the probability of being so deposited is about the same for particles smaller and larger than 1 μ, i.e., $\frac{1}{2}$ μ vs. 2 μ, $\frac{1}{4}$ μ vs. 4 μ, etc.

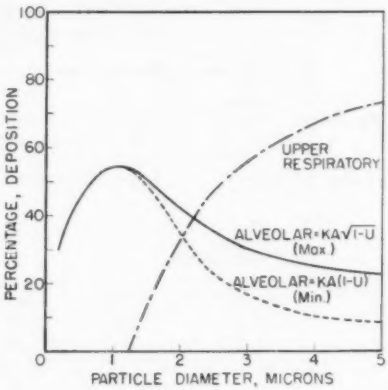


FIGURE 5—Percentage deposition of inhaled dust in the upper respiratory tract and alveoli in relation to particle size (calculated from the experimental curves in Figure 4).

The results of this study confirm previous findings and extend the data into more final form since, unlike previous techniques, the procedure employed here provides positive identification of alveoli deposition as distinguished from "lung" deposition which includes dust deposited in the air passages above the alveoli. These latter particles are of little interest in silicosis and other pulmonary diseases of particulate origin.

It is to be noted that the experimental size range does not include particles smaller than the critical minimum of about $\frac{1}{4}$ μ. The work is being continued to include such sub-microscopic particles and also to determine the effect of varying respiratory patterns and other factors of interest.

(For references, see page 480)

Effect of Free and Combined Available Residual Chlorine upon Bacteria in Swimming Pools*†

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ONE purpose of sanitary control of swimming pools is the maintenance of some fixed amount of residual chlorine, which will kill bacteria as they are washed into the water from the bathers' bodies rapidly enough to prevent conditions of gross pollution. In an attempt to standardize the magnitude of this fixed amount of residual chlorine, inconsistent bactericidal results were frequently obtained when a standard quantity of residual chlorine was used. These incongruous bacteriological findings were probably caused by the alternate presence of the two components of total residual chlorine, namely, free available residual chlorine and combined available residual chlorine. In 1942, the report for the design, equipment, and operation of swimming pools by the joint committee of the Conference of State Sanitary Engineers and the American Public Health Association[1] recommended a residual chlorine concentration of 0.4 p.p.m. to 0.6 p.p.m. when the pool was in use, and 0.7 p.p.m. to 1.0 p.p.m. for residual chloramine. This latter figure was modified in 1948 to suggest the desirability of operating with higher chloramine residuals up to 2.0 p.p.m., based upon recent studies. The terminology, chloramine residual, has been changed to combined available chlorine residual, by the American Water Works Association committee which prepared the chapter on "Chlorination and Other Disinfection Practices" for the forthcoming *Manual of Water Quality and Treatment*.[2]

The development of the orthotolidin-arsenite colorimetric test[3] and the amperometric titration method[4] for determining residual chlorine gave the sanitary engineer quick, efficient and accurate methods for measuring in the field the quantities of free and combined available residual chlorine present in water. With these resources available a study was undertaken to measure the relative effectiveness of free and combined available residual chlorine as bactericides in swimming pool water. To obtain this measurement it was decided to use tests for the number of bacteria which grow on agar at 35–37° C., coliform bacteria and streptococci. The first two tests are in common usage in sanitary bacteriology, but the latter test is not widely used in this country. There has been some disagreement in regard to the usefulness of the streptococcal

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NOTE: This study is a section of a coöperative project undertaken with W. L. Mallmann, Michigan State College, and with financial assistance provided by the Wallace & Tiernan Co., Inc., Newark, N. J.

density in evaluating the sanitary quality of swimming pool water. Mallmann[5] and France and Fuller[6] claimed that streptococci are a good measure of contamination in swimming pool water, but Ritter and Treace[7] concluded that the presence of these organisms in swimming pool water has no public health significance.

For this study, four pools in Connecticut were selected. Each pool was operated in accordance with the requirements of the Joint Committee Report and were of the continuous recirculation type. All pools used fresh water and three were located indoors. Although combined residual chlorination through the use of ammonia gas was not the practice by intention, one pool applied aluminum ammonium sulphate and actually obtained this method of disinfection and a second pool changed to it accidentally during the test period by changing coagulants.

Each of the four pools was tested on three occasions making a series of twelve tests within this study. Before each test, the residual chlorine content was measured to insure reasonable adherence to the minimum and maximum standard for disinfection as set forth in the Joint Committee Report (see Table 1). The amperometric titration was used in preference to the orthotolidin-arsenite test to measure free and combined available residual chlorine because the high temperatures of swimming pool waters cause the color reaction of chlorine and orthotolidin to occur too quickly for accurate results.

TABLE 1

Residual Chlorine Content of Swimming Pools Included in This Study

Free Available Residual Chlorine	*Combined Available Residual Chlorine*	*Total Available Residual Chlorine*
p.p.m.	*p.p.m.*	*p.p.m.*
0.40	0.00	0.40
0.50	0.00	0.50
0.40	0.10	0.50
0.40	0.05	0.45
0.35	0.05	0.40
0.80	0.00	0.80
0.60	0.30	0.90
0.00	0.50	0.50
0.00	0.60	0.60
0.00	0.35	0.35
0.10	0.60	0.70
0.00	0.90	0.90

The sampling procedure for the twelve tests was identical for each occasion. The pool was closed to swimmers at least one hour before the start of the test to permit the purification processes to reduce the bacterial content to a practical minimum. Just before the start of the test, samples were collected and titrated with the amperometric titrator to determine the quantity of free and combined available residual chlorine present. Three sampling points were used; one at the midpoint of the shallow end and two on the sides, one-third the distance from the shallow end toward the deep end. At the start of the test period the bathers lined up around the edge of the pool at equal intervals. The initial bacteriological samples were collected at the three sampling points, and then at a given signal all bathers dove into the pool and swam for 5 minutes. Additional samples for bacteriological analyses were collected simultaneously from the three sample stations at the following intervals, timed from the moment the bathers entered the water: ½, 1, 1½, 2, 2½, 3, 4, and 5 minutes. At the end of the 5 minute swim period another signal was given to the bathers to withdraw quickly from the water, and, following an interval of 5 minutes more during which no bathers were allowed to go into the water, a final set of samples was collected.

The bacteriological samples were analyzed promptly after collection. The procedures used were those recommended in *Standard Methods of Water Analysis,* Eighth Edition[8] except that the tryptone glucose extract agar plates were incubated at 35–37° C. for 48 hours, instead of 24 hours, to permit eas-

ier counting of the colonies. Duplicate plates of 0.1 ml. and 1.0 ml. dilutions were poured for each sample. Two per cent brilliant green bile broth was used as the confirmatory medium for coliform bacteria.

The results from the series of twelve tests were placed in one of two categories, those collected from swimming pool water containing free available residual chlorine equal to or in excess of 0.35 p.p.m., and those collected from water with combined available residual chlorine predominating and having 0.10 p.p.m. or less free available residual chlorine. The former group will be referred to as the free available residual chlorine group and the latter as the combined available residual chlorine group. Seven of the twelve sample series were classified as belonging to the free available residual chlorine group.

The first measurement of the relative germicidal properties of free available residual chlorine as compared to combined available residual chlorine used the total agar plate count. A geometric mean of the number of bacteria growing on tryptone glucose extract agar at 35–37° C. for 48 hours for 1.0 ml. for each time interval during the sampling series for each of the two residual chlorine categories was determined (see Table 2). Geometric means were used in preference to arithmetic means to limit the undue influence caused by one exceptionally high or low value. By plotting these values against time, very interesting and noteworthy results are obtained (see Chart 1). The trends of the two graphs are similar and have the characteristics of a parabola with a maximum value at the 4 minute point. No interpretation of the trend of the graph beyond the 4 minute point was made because of the limitations imposed by the 5 minute swimming period. Actually, the maximum values for both free available residual chlorine and combined available residual chlorine, occur at the

TABLE 2

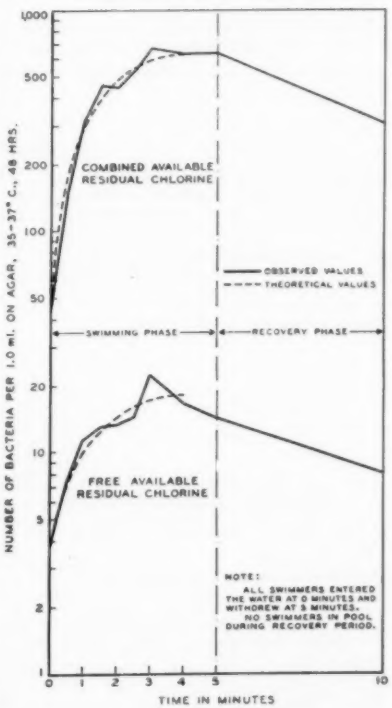
Geometric Means of the Number of Bacteria on Agar per 1.0 ml., 35–37° C., 48 Hr. Incubation

Time (in minutes)	*Geometric Mean of Number of Bacteria on Agar/1.0 ml., 35–37° C., 48 hrs.*	
	Pools with free available residual chlorination	*Pools with combined available residual chlorination*
0	3.8	42
0.5	7.4	148
1.0	11.2	315
1.5	12.9	453
2.0	13.2	445
2.5	14.3	539
3.0	22.1	672
4.0	16.5	630
5.0	14.2	634
10.0	7.9	304

Note: All swimmers entered water at 0 minutes and left at 5.0 minutes. No swimmers in water at 5–10.0 minutes.

CHART 1

GEOMETRIC MEAN OF BACTERIA IN SWIMMING POOLS WHEN IN USE



3 minute value but the deviation from the theoretical parabolic curve with a maximum value at the 4 minute point is within the limits of experimental error. Statistically, these theoretical curves fit the data best.

The difference in the magnitude of the values for free available residual chlorine and combined available residual chlorine is striking. The initial value for swimming pool water with free available residual chlorination is but 3.8 bacteria per 1.0 ml. as compared to 42 bacteria per 1.0 ml. These values represent the number of bacteria resistant to residual chlorine as they are obtained from samples collected after the passage of at least 1 hour since the last swimmer was in the water. The ratio of the magnitude of these values is 1:11.1.

Comparing the actual maximum values in a similar manner it is found that the pools with free available residual chlorine have a density of only 22.1 bacteria per ml. contrasted with 672 bacteria for pools with combined available residual chlorine. In other words the latter type pools have 30.4 times as many more bacteria present at the maximum concentration than the former. The theoretical values are 18.0 bacteria per ml. for free residual chlorine and 630 for combined available residual chlorine with a ratio of magnitudes of 1:35.0. The values for the total number of bacteria per ml. after a 5 minute recovery period during which no bathers were present in the pool are 7.9 and 304 for pools with free and combined available residual chlorine, respectively. The difference in the maximum values for free available residual chlorine and combined available

TABLE 3

Relationship of Free Available Residual Chlorine and Combined Available Residual Chlorine to the Number of Samples Positive for Coliform and Streptococcal Bacteria When Bathers Were in Swimming Pools

	Number of Samples Positive for Coliform Bacteria	*Number of Samples Negative for Coliform Bacteria*	*Total Number of Samples Analyzed for Coliform Bacteria*
Pools Practising Free Available Residual Chlorination (Free available residual chlorine equal to or in excess of 0.35 p.p.m.)	5	163	168
Pools Practising Combined Available Residual Chlorination (Combined available residual chlorine equal to or in excess of 0.35 p.p.m. and free available residual chlorine equal to or less than 0.10 p.p.m.)	84	36	120
Total	89	199	288
	Number of Samples Positive for Streptococcal Bacteria	*Number of Samples Negative for Streptococcal Bacteria*	*Total Number of Samples Analyzed for Streptococcal Bacteria*
Pools Practising Free Available Residual Chlorination (Free available residual chlorine equal to or in excess of 0.35 p.p.m.)	103	65	168
Pools Practising Combined Available Residual Chlorination (Combined available residual chlorine equal to or in excess of 0.35 p.p.m. and free available residual chlorine equal to or less than 0.10 p.p.m.)	106	14	120
Total	209	79	288

residual chlorine compares favorably with the findings of Butterfield [9] who found that to obtain 100 per cent kills in the same exposure time from 15 to 60 times (average of 30) as much combined available residual chlorine was required as compared with free available residual chlorine.

A graphic demonstration of the respective behavior of coliform and streptococcal bacteria in the presence of free and combined available residual chlorine cannot be made because these values are most probable numbers (M.P.N.) and, as such, are limited in their minimum and maximum values by the range of the dilution of the samples tested. In these tests the minimum value is less than 2.2 organisms per 100 ml. and the maximum greater than 240 per 100 ml. Results occurring at either extremity are represented by indeterminate values and cannot be used in obtaining means. To measure the relative bactericidal properties of free available residual chlorine and combined available residual chlorine the results of analyses for coliform and streptococcal bacteria were compiled into fourfold tables (see Table 3). These tables are a breakdown of the samples collected while swimmers were in the pool water to show the number of samples positive for coliform and streptococcal bacteria as compared to the alternate presence of free and combined available residual chlorine. The tabulation of the results for coliform bacteria indicates that only 5 samples out of 168, or 3 per cent, showed the presence of coliform bacteria in any dilution in the water with free available residual chlorine while 84 samples out of 120, or 70 per cent, were positive for coliform bacteria in pools having combined available residual chlorine. When the chi square test is applied to these data a very highly significant result is obtained, which means that within the range of this study free available residual chlorine is more effective than combined available residual chlorine in swimming pools in killing coliform bac-

TABLE 4

Relationship of the Number of Samples Positive for Coliform and Streptococcal Bacteria to Free Available Residual Chlorine and Combined Available Residual Chlorine. (Samples Collected When Bathers Were in Pools)

Pools Practising Free Available Residual Chlorination (Free Available Residual Chlorine Equal to or in Excess of 0.35 p.p.m.)

	Number of Samples Positive	*Number of Samples Negative*	*Total Number of Samples Analyzed*
Samples tested for presence of coliform bacteria	5	163	168
Samples tested for presence of streptococcal bacteria	103	65	168
Total	108	228	336

Pools Practising Combined Available Residual Chlorination (Combined Available Residual Chlorine Equal to or in Excess of 0.35 p.p.m. and Free Available Residual Chlorine Equal to or Less than 0.10 p.p.m.)

	Number of Samples Positive	*Number of Samples Negative*	*Total Number of Samples Analyzed*
Samples tested for presence of coliform bacteria	84	36	120
Samples tested for presence of streptococcal bacteria	106	14	120
Total	190	50	240

teria. The tabulation of the results for streptococcal bacteria indicates that 103 samples out of 168, or 61 per cent were positive for streptococci in swimming pool water with free available residual chlorine, and that 106 samples out of 120, or 88 per cent, contained streptococcal bacteria in the presence of combined available residual chlorine. The chi square test gives a highly significant value to this relationship, indicating that within the limits of this study free available residual chlorine is a more effective bactericide against streptococcal bacteria than combined available residual chlorine.

If these same data are regrouped (see Table 4) to measure the relative resistance of coliform and streptococcal bacteria to free and combined available residual chlorine, it is found that streptococci are more resistant to both free and combined available residual chlorine in the concentrations encountered in this study than coliform bacteria, but the greatest difference in resistance was ob-

TABLE 5

Relationship of Number and Per Cent of Samples Showing Coliform Indices Greater than and Less than Streptococcal Indices as Affected by the Presence of Free Available Residual Chlorine and Combined Available Residual Chlorine

Samples from Pools with Free Available Residual Chlorination (free available residual chlorine equal to or in excess of 0.35 p.p.m.)

Time In Minutes	*Number of Samples*	*Coliform Index Greater than Streptococcal Index*		*Coliform Index Less than Streptococcal Index*	
		No.	*%*	*No.*	*%*
0.0	21	0	0	1	4.8
0.5	21	2	9.5	11	52.4
1.0	21	0	0	14	66.7
1.5	21	0	0	11	52.4
2.0	21	1	4.8	14	66.7
2.5	21	0	0	14	66.7
3.0	21	0	0	14	66.7
4.0	21	0	0	14	66.7
5.0	21	0	0	12	57.2
10.0	20	0	0	12	60.0
Total	209	3	1.4	117	56.0

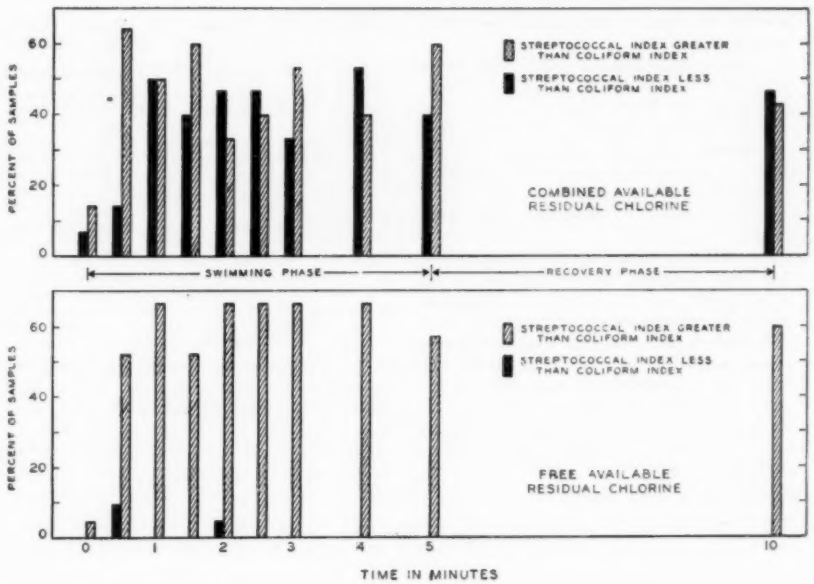
Samples from Pools with Combined Available Residual Chlorination (combined available residual chlorine equal to or in excess of 0.35 p.p.m. and free available residual chlorine equal to or less than 0.10 p.p.m.)

Time In Minutes	*Number of Samples*	*Coliform Index Greater than Streptococcal Index*		*Coliform Index Less than Streptococcal Index*	
		No.	*%*	*No.*	*%*
0.0	14	1	7.1	2	14.3
0.5	14	2	14.3	9	64.3
1.0	14	7	50.0	7	50.0
1.5	15	6	40.0	9	60.0
2.0	15	7	46.7	5	33.3
2.5	15	7	46.7	6	40.0
3.0	15	3	33.3	8	53.3
4.0	15	8	53.3	6	40.0
5.0	15	6	40.0	9	60.0
10.0	14	7	46.7	6	42.8
Total	146	56	38.4	67	45.9

Note: Swimmers entered water at 0 minutes and left at 10.0 minutes. No swimmers in pool at 5–10 minutes.

CHART 2

RELATIONSHIP OF STREPTOCOCCAL AND COLIFORM INDICES



served in the samples collected from swimming pool water containing free available residual chlorine.

Another demonstration of the resistance of streptococci and coliform bacteria to free available residual chlorine and combined available residual chlorine may be made by determining the per cent of samples having a streptococcal density greater than coliform and vice versa (Table 5 and Chart 2). Pools practising free residual chlorination show a definitely higher percentage of samples with a streptococcal index greater than coliform. This relationship cannot be shown for combined available residual chlorination practices, probably because the lethal concentration of combined available residual chlorine for coliform bacteria in swimming pool water was not reached in this study under the bathing loads encountered.

From the above data it is readily understandable why incongruous bacteriological results have been obtained from swimming pools having the same bathing loads and the same total residual chlorine content but with varying quantities of free available residual chlorine. Free available residual chlorine is the bactericide of choice to obtain acceptable bacterial densities in swimming pools while in use and at the same time maintain a low concentration of total residual chlorine.

This study failed to clarify the role of streptococci as indicators of pollution in swimming pool water, but has pointed out that streptococci are recovered readily in swimming pools when in use even in the presence of concentrations of free available chlorine that are bactericidal to coliform bacteria.

CONCLUSIONS

From this study on chlorination of

swimming pools the following general conclusions are reached:

1. Free available residual chlorine is a more effective bactericide than combined available residual chlorine for the treatment of swimming pool water.
2. The values of 0.4 to 0.6 p.p.m. of residual chlorine as recommended by the Joint Committee Report, if interpreted to mean free available residual chlorine, will produce bacteriological results that will comply with the Joint Committee Report's recommended standards for total number of bacteria and coliform bacteria in swimming pools when in use.
3. The minimum value of 0.7 p.p.m. which has been suggested in the past for swimming pools using chloramine (combined available residual chlorine) treatment is insufficient to produce bacteriological results under conditions of this study which will meet the recommended standards of the Joint Committee Reports.
4. Streptococcal bacteria in swimming pools are more resistant to chlorine than coliform bacteria.

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Waksman Foundation in France

The Trustees of Rutgers University Research and Endowment Foundation, holder of patents on streptomycin and other antibiotics developed by Dr. Selman A. Waksman in the university's department of microbiology, have approved the establishment of a foundation to encourage microbiologic investigations in France, to be known as the Waksman Foundation.

This foundation was launched with an initial contribution of 3,000,000 francs from Rhone-Poulenc, French chemical concern, which is licensed by the Rutgers Research and Endowment Foundation to manufacture streptomycin in France. The new French foundation will be supported by royalties due to the Rutgers Foundation from Rhone-Poulenc. The funds will be used for the support in France of research on antibiotics and on other problems in the field of microbiology. Four grants, totaling 2,140,000 francs, were proposed by the committee of the French foundation at its first meeting in December. Three will go to workers at the Pasteur Institute in collaboration with various hospitals in Paris, and the fourth to a staff member in the biochemical laboratories of the Ministry of the Colonies. The executive committee of the French foundation consists of a representative of the French Academy of Medicine: Professor Jacques Trefouel, member of the French Institute and director of the Pasteur Institute, and Professor R. Paul, scientific director of Rhone-Poulenc.

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THE PUBLIC HEALTH LIBRARY

FOR three years now, the April issue of this *Journal* has included special emphasis on the problems of the public health library. In 1948, Huntington Williams presented a review of "The Health Officer's Bookshelf," and last year George Rosen followed with "The Health Educator's Bookshelf." In the present issue, Albert H. Harris discusses some of the items which should be found on "The Laboratory Bookshelf."

The most important single step ever taken in the history of human invention was the development of printing, since the stimulation and cross-fertilization made possible by the printed word lies at the base of all progress in human thought. It is amusing to recall that the Universities of Paris and Bologna resented the new procedure as interfering with their profitable trade of copying manuscripts. Yet after the printing of the Gutenberg Bible in 1454, the process of printing spread by 1475 to Italy, to England, to Switzerland, Belgium, and Holland. The Renaissance was in full swing.

The Mississippi State Board of Health has, in recent years, played a leading part in emphasizing the important role of the Library in a department of health. Miss Σ. Louise Williams, librarian on Dr. Underwood's staff, has pointed out that "A good medical library is indispensable to the protection of health and the prevention of disease. Only as men thirst after and drink at the vast fountain of scientific knowledge, which has come to be recorded in such a library's collection, can they hope to apply accurately the best principles of preventive medicine and be able to contribute further to the remarkable progress of recent decades. The library, properly utilized, can save lives and improve the lot of great masses of the population." She emphasizes the essential importance of a good working library to the research worker, and the value of the hospital and the medical society library. The large health department library, she adds, "will attempt to have a collection of working tools for the guidance of public health workers, a good cross-section of the general medical literature for the reference use of physicians, dentists and others, and finally an extensive collection of authoritative books on health and disease written primarily for the layman."

The concept of the health department library as a community center for health education on the higher levels is often not applicable in large centers where the libraries of schools of public health or of medical societies may fully serve all local needs. There are, however, many areas (perhaps most areas in the United States) where such needs are not otherwise met. The State Board of Health at Jackson maintains the only library in Mississippi established for the service of the medical and health professions. It offers not only a reading room but a mail lending-library service. In one recent biennium it added 639 volumes to its shelves, of which about half were bound volumes of periodicals. Its mimeographed list of "Basic Books for the Local Health Department" includes more than 120 titles, and 14 journals are listed as "indispensable." In a recent circular to health workers throughout the state, it was pointed out that "every local health department should have two or three shelves of the basic books in public health and these should be accessible to all members of the staff for easy consultation" (to be supplemented by loans from the State Library when necessary).

The wide community service carried on in Mississippi may be impracticable in many areas. The need of the staff for adequate reference material is, however, universal. The New York State Health Department, for example, has an admirable working library (under the direction of Miss Sexton). The Louisiana State Board of Health has a library of very precious volumes relating to the early history of public health. Every city and town department of health should certainly have its "two or three shelves" of basic books. They are essential for the administrator, the medical specialist, the engineer, the laboratory worker, the industrial hygienist, the educator, the nutritionist, the nurse.

We urge all our readers to review the adequacy of their library budgets and to consider whether they are asking their staff to make bricks without straw. We suggest that larger departments, which may be reasonably well supplied with books, remember that the maintenance of a library and its effective use depend upon expert leadership. In such departments the trained or experienced public health librarian should be recognized as an essential member of the staff.

THE VANISHING VECTORS

THE thoughtful reader will find the address by J. M. Andrews in this issue of the *Journal* a fascinating story of man's triumph over his insect enemies. The control of diseases transmitted by arthropods stands—with the control of other diseases by protective immunization—as one of the two most dramatic victories of public health.

On this front of the war against disease we have had certain manifest advantages. The more complicated the life history of a parasite, the more vulnerable it must be to attack. Where there is an intermediate host, we can break the chain of infection by eliminating the non-human vector or by controlling the passage of the germ from man to the vector or from the vector to man; and, in areas where economic conditions permit such control, plague and typhus fever, malaria and yellow fever have lost the terrible potencies of the past. The discovery of such new weapons as DDT has enormously strengthened our defenses along this line.

It is true, as Dr. Andrews has pointed out, that these defenses have their basic limitations. The chemicals we use to destroy insects may—if carelessly used—be in themselves harmful to man, although such danger does not seem serious. It is also true that strains of insect carriers develop which have special resistance against a

particular toxic substance; but, with the variety of chemical weapons at our disposal, this difficulty can usually be overcome.

On our side is one very powerful influence. The economist has to face a Law of Diminishing Returns; but in the control of insect carriers of disease, we have the advantage of a Law of Increasing Returns. Long before the last human carrier of malaria and the last *Anopheles* mosquito have disappeared, the chance that a given mosquito will receive infection from a human carrier and transmit it to a susceptible victim within a definite time limit becomes mathematically so small that the disease disappears.

In certain cases it has actually been possible to eradicate a particular type of insect vector from a particular region of the globe. This was achieved with *Anopheles gambiae* in northeast Brazil, and in Sardinia, Cyprus, and Tobago programs for complete elimination of anophelines are under way. "Chile claims to be the first, and at present the only American country to have exterminated both malaria and anophelism."

Practically complete control of actual human disease can, however, be accomplished by far less rigorous methods. A century ago even the Northern United States was a hotbed of malaria. The chills and ague described in Martin Chuzzlewit were almost universal phenomena. The building of the Erie Canal had to be interrupted in summer because so many workers were incapacitated by malaria. Malaria was still mildly endemic in New England up to a quarter of a century ago. Today all this has changed; and, in large measure, the change has been brought about, not by intentional antimalarial campaigns, but by elimination of breeding places through agricultural drainage and protection of man through better constructed houses.

The same process—materially aided by specific anti-anopheline programs—has more recently taken place in the South. *Public Health Reports* cites 5,238 cases of malaria for the United States in the year including the last quarter of 1948 and the first three quarters of 1949. Of these, 3,227 were reported from Texas, 699 from South Carolina, and 400 from Arkansas, leaving only 912 cases for all the rest of the country. Even the small number of cases now reported is perhaps higher than the actual facts warrant. Students of malaria in such institutions as Tulane find it practically impossible to obtain indigenous malaria cases for research and are forced to limit themselves to the study of treated paretics. In one southern county supposed to have a high incidence of malaria, a bounty was offered of $5 for every reported case substantiated by blood examination. The county spent $70 in a year. It is clear that malaria has almost disappeared from our southeastern states and it is probable that the doctors are in some instances reporting a variety of obscure fevers as malaria, with no valid justification. The fact that tens or hundreds of thousands of veterans returning from the Pacific with malarial plasmodia in their blood streams caused not a single serious local epidemic was a surprise to many of us. It gave convincing proof that the conditions necessary for the spread of this disease were absent. Malaria in the entire United States is now a vanishing disease.

This is, of course, no argument for a let-up in the precautionary measures which have made this satisfactory situation possible. In malaria control, as in typhoid control and diphtheria control, constant vigilance is the price of liberty. In the less fortunate areas of the world—with which post-war developments have brought us into close relations—the control of insect vectors is the No. 1 health problem.

The major microbic threat to the continental United States, however, is that of the upper respiratory infections and such epidemiologically allied diseases as polio-

myelitis. Here the transfer is direct from man to man so that no intermediate vector exists which can be effectively controlled. Here, too, the parasite is so well adjusted to the human host that well carriers are so numerous as to make isolation procedures almost valueless. On this front of the war against disease, the microbe has a strategically strong position. It seems probable that in dealing with this group of diseases epidemiological defenses are not promising; and that it would be wiser to focus our research on the physiological processes which contribute to the resistance—or lack of resistance—of the individual human host. If a new Pasteur could tell us why upper respiratory epidemics occur in winter and poliomyelitis epidemics occur in summer, we might be able to build physiological defenses as significant as those epidemiological defenses which are yielding such spectacular results in the control of yellow fever and malaria.

CHRONIC DISEASE AS A PUBLIC HEALTH PROBLEM

IT is an encouraging sign of the alertness of leaders in medicine and public health that interest in the problems of chronic illness is growing with leaps and bounds. Our most progressive state and city health departments are, more and more, giving these problems first priority in their planning for the future.

A recently published report of the California Department of Public Health [1] well illustrates the importance of the issue. Of California's 10 million population it is estimated that approximately half a million have *diagnosed* chronic illness. Almost a fourth of these are permanently disabled. In addition, a hundred thousand Californians are thought to have *undiagnosed* heart disease, and 70,000 undiscovered diabetes. These statistical estimates of the number of persons having some sort of chronic illness follow fairly closely those made in New York and Connecticut. Such data necessarily fall short of providing accurate information as to the number of persons affected by various degrees of disability and they cannot be translated into quantitative estimates of the diverse services needed by these persons. The time seems ripe for conducting field surveys, in which an adequate sample of the chronically ill would be studied medically to determine their needs in quantitative terms.

At the state level, the report recommends that the State Department of Public Health in California establish an advisory chronic disease council, study the need for additional hospitals and laboratories to carry on research in chronic disease, maintain a statistical service on chronic disease, and help plan programs for professional education in the field. The department and the California Advisory Hospital Council are urged to devote special attention to the need for adding chronic hospital beds and to the "development and expansion" of custodial, nursing home, home care, and rehabilitation services.

"Local health agencies" are charged with the responsibility for developing preventive services, including mass screening methods, for "making available adequate diagnostic and therapeutic services either in their own communities" or by arrangement with nearby communities, for making available "sufficient nursing custodial substitute home care facilities" and for developing "comprehensive home care programs" including "diagnostic and therapeutic services, bedside nursing, medical social service and housekeeping service."

Another recent report of great significance is that of the Commission on Chronic Illness [2] summarizing the proceedings of the first meeting of that Commission. This Commission, it will be recalled, was created under the sponsorship of the American Hospital Association, the American Medical Association, the American Public

Health Association, and the American Public Welfare Association, to serve as a national clearing house in regard to the problems of chronic disease, to stimulate or perform research to develop standards and criteria, to carry out an educational program and to assist and advise national, state, and local agencies working in this field. At the meeting last May, the viewpoints of the four sponsoring agencies were presented, with reports from five groups of technical advisers and a vigorous and moving address by Surgeon General Leonard A. Scheele. It was pointed out that the problem of chronic disease is not necessarily associated with senility and is not limited to any age group. "A chronic illness is an impairment in health that requires an extended period of medical supervision." It is a problem of universal appeal. As Dr. Scheele points out: "The physician who today sends a patient to the county home as 'hopeless'—may one day pray that someone will be interested enough in his case to try at least to get him out of bed and into a wheel chair.

"The manager of a 'nursing home' who tonight scolds the restless oldster—may one day long for a word of kindness in her suffering.

"The business man who cannot find a job for a rehabilitated chronic patient—may one day find his own idleness—enforced by chronic disease—the bitterest drop in his cup.

"The law-maker who this year votes a budget of less than $1.00 per patient per day to pay for all services—including food—in his state's mental hospital—may one day find himself trying to eat the swill that such a budget affords.

"The clubwoman who refuses funds for a community visiting nurse in favor of a monument on the city common—may one day plead for skillful hands to help in the home care of her husband."

The care of long-term illness need no longer be considered as involving "a prolonged despair." As Dr. E. P. Boas points out, "The most hopeful aspect of the intensified interest in this problem of chronic diseases is the fact that we have made a turn-about, that we no longer place our chief emphasis on salvaging people in the late stages of these chronic illnesses, but that we are addressing ourselves to an attempt to discover these disease conditions early, to control their development, and possibly to achieve their prevention.

"This Commission has wisely set as its first objective 'to modify the attitude of society that chronic illness is hopeless.'"

A most important conference on one phase of this major problem, that relating to cardiovascular disease, was held in Washington January 18–20, 1950, under the sponsorship of the American Heart Association and the National Heart Institute. Careful preliminary planning led to the preparation of factual data in each of the major areas of cardiovascular diseases. These reports are masterpieces of brevity and scientific knowledge. Some 20 scientists prepared statements regarding present and potential contributions of science to the problems of cardiovascular diseases. All of this material is fascinating reading—some, such as the material on congenital heart disease, now more than ever is an absolute must for physicians and anyone working on the cardiovascular diseases; and these statements should be generally available in the near future.

The reports discussed above highlight what is perhaps the major challenge to public health leaders of today. Dr. E. S. Rogers at the meeting of the Commission on Chronic Illness stated that the public health aspects of chronic illness may well be recognized as a seventh basic function of the health department, along with vital statistics, laboratory services, communicable disease control, sanitation, maternal and child health, and health education. It is obviously essential that our defenses

against epidemic disease, our promotion of child health, and our educational programs be maintained at full strength. But in research, program-planning, coördination, leadership and—where necessary—administration of facilities for the prevention and care of chronic illness, lie the great opportunities for the future. Our response to this challenge will largely determine our usefulness as a profession, our prestige, our financial support, our success in recruitment of personnel. Young men of vision and initiative entered the public health profession twenty or thirty years ago because public health was meeting new problems and meeting them with courage and imagination. We can attract the same type of recruits today by ourselves displaying similar vision and leadership.

1. *A Chronic Disease Program for California.* California State Department of Public Health, January, 1949.
2. *Proceedings of First Meeting of the Commission on Chronic Illness,* May 20, 1949.

WILLIAM CREIGHTON WOODWARD

THE death of Dr. W. C. Woodward, on December 22, 1949, marked the passing of the senior Past President of our Association.

Dr. Woodward was born on December 11, 1867, and took his medical degree at Georgetown in 1889. He held several minor governmental posts after graduation, and in 1894 was appointed Health Officer of the District of Columbia, a position which he held for the extended period of twenty-four years. While serving in this capacity, he found time to study law, and received his degree of LL.M. from Georgetown in 1900.

In 1918, he became Health Officer of Boston where he served for four years. In 1922, he was appointed head of the Bureau of Legal Medicine and Legislation of the American Medical Association, a post which he continued to fill until 1939.

Dr. Woodward, while in Washington, Boston, and Chicago, taught in both the medical school and the law school of Georgetown University, receiving the LL.D. degree from that institution in 1925. He served as President of the A.P.H.A. in 1913–1914, and was also President of the Conference of State and Provincial Health Officers.

In his combination of both medical and legal competence, Dr. Woodward was unique, and his service of twenty-eight years as health officer of two of our largest cities gave him a distinguished place in the history of American public health.

LETTER TO THE EDITOR

TO THE EDITOR:

The editorial, entitled "Office Management," which appeared on page 82 of your January number, suggests the emergence of a set of concepts and practices from the area of common sense into the realm of the conscious application of established principles. Most of our present bodies of knowledge have passed through the same evolutionary process, and some are even graced with the name *science*. I should like to make the point, however, that office management, whatever its definition, is but part of a frequently unrecognized whole, namely, administration.

This word, administration, has meant different things to different persons at

different times. Let us consider it here in its original sense as comprising: (a) the marshalling of resources—material, technical, and above all human (organization); and (b) the disposition of these resources so that a stated objective can be achieved (management). These two fundamentals of organization and management can be likened, crudely, to structure and function, and as in biology there is a close interrelationship and overlapping. More complete, therefore, than a consideration of "office management" is that of the basic substance—administration.

The term, "office management," is a somewhat oblique, as well as incomplete, expression of one of the administrator's chief problems. Office management belongs in a general discussion no more than does clinic management, home visit management, inspectorial management, conference management, or that of any other specific activity. A more direct consideration is a classification of the actual components of the administrative process, such as: sources of authority; executive functions; departmentation; administrative planning; budgeting; supervision; coördination; administrative control, etc. Throughout all of these courses the life's blood of administration, described variously as personnel management, interpersonal relationships, psycho-dynamic administration, democratic administration, administrative mental hygiene, group administration, or perhaps just an understanding of applied psychology. Here, then, are the ingredients of the art and science of administration which need to be brought forth from "common sense" into the sphere of conscious application of principles.

Nothing can be more disastrous to the Public Health Director than to assume that he can, by transference to a management expert or personnel officer, be rid of his administrative duties in these respects. Every executive must be an administrator; in fact, this is the skill for which he is hired. His ability as a bacteriologist or diagnostician should carry proper weight in the appropriate situation, but primarily the Health Director is a *manager*. True, an administrative analysis of his agency's activities by an outside expert is bound to be fruitful, but is not a complete answer.

That administration can be taught has been pointed out in your editorial. Public health students should be given instruction in Public Health *Administration* (as defined here) as well as in the subjects included under Public Health *Practice*, such as disease control, health promotion, etc. Emphasis should be placed upon the interpersonal relationships which are so much a part of the administrative environment. In other words, knowledge of principles of both "formal" and "democratic" administration should be included in the Health Director's professional equipment.

Your editorial is valuable in that it encourages the Public Health Director to improve the office management practices of his agency. The achievement of a well run office may even release him for other important tasks. Your advice is good, and should be widely accepted with excellent results. It sometimes becomes necessary, however, to remind the Public Health Director that, over and above a well run office, the success of his agency's program depends largely upon the *administrative* capabilities to which that agency has access.

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Clearing House on Public Health Salary Information and Personnel Needs

AMA RESOLVES FOR ADEQUATE SALARIES

At its meeting in Washington, December 6–9, 1949, the House of Delegates of the American Medical Association recorded its conviction that adequate salaries must accompany other health officer recruitment techniques, in the following resolution:

WHEREAS, The American Medical Association through its officially adopted program for the advancement of medicine and public health has urged the establishment of local public health units with such services as communicable disease control, vital statistics, environmental sanitation, control of venereal diseases, maternal and child hygiene, and public health laboratory services; and

WHEREAS, The present bottleneck in the accomplishment of these goals lies in the shortage of adequately trained physicians; and

WHEREAS, The remuneration of medical health officers must be commensurate with their responsibility in order to encourage recruitment in this vital area; now therefore be it

RESOLVED, That the American Medical Association records its conviction that the salaries paid for full-time service in the medical specialty of public health should be commensurate with their responsibilities, the cost of living, and salaries paid in similar positions.

RECRUITMENT NOTE—EARLY CASUALTIES

Read this paragraph slowly. A total of 6,497 students registered in the medical schools of the country in September, 1948. But, 6,973 out of 24,242 making 81,662 applications were accepted. In other words, fewer than one-third of those who wanted to go to medical school to the extent of applying, on an average, to more than three schools each, were accepted. And after they were accepted, another 7 per cent fell by the wayside for reasons not reported.

This information and further details will be found in the November, 1949, (24:6) *Journal of the Association of Medical Colleges*. Among these details is the fact that more than 13,000 of the students applied to two or more schools. Two students applied to 39 schools, half of the schools in the United States; 82 students applied to more than 25 schools each. Nearly one-eighth of the students accepted were accepted by more than one school, in one instance by eight schools.

By way of earlier data, it is noted that 1948 applications were 44 per cent higher than those of 1947 and 125 per cent higher than of 1938.

What is the moral? Should the existing facilities for training medical students be expanded? Are more medical schools needed? Do a large proportion of applicants fail to qualify? Do vocational services in high schools and colleges need to encourage students into professions other than medicine? Would some of these casualties make good recruits for non-medical jobs in the public health field? All of those are unanswered questions for your further pondering.

MORE RECRUITING IN MISSISSIPPI

Mississippi which continues to have the lowest per capita income of the 48 states, also continues to work hard at overcoming the disadvantages of its relative poverty. Former issues of the *Journal* have reported on some of the state's activities in the recruitment of rural physicians (*A.J.P.H.* 37, 2:214; 39, 3:387) and in the recruitment of public health physicians (37, 1:95).

In continuing its activities for the recruitment of physicians to practise in

Mississippi, it has published a number of other reports. Both in March and December, 1949, the Mississippi State Board of Health published "Places To Locate To Practice Medicine in Mississippi." For 38 counties in the former and 63 in the latter, facts about population, number and location of physicians, hospital beds, and health centers were shown, together with the names of one or more physicians in each county who could give further information about the local situation. These reports had "wide distribution," presumably to last year medical students, and various lists of young physicians.

The later brochure included a tabulation showing age distribution of practising physicians for each county of the state. Of those currently practising in areas of the state outside of cities, 61 per cent were 60 years of age or over and only 20 per cent were under 40. It further showed that on a population basis the average number of persons per physician was more than six times as great in rural areas as in cities. (The limitations of these figures must be remembered, namely that physicians living in cities do not confine their practices within the city limits.)

What is now needed is an analysis of the results of this program for guidance in other states that are seeking recruitment techniques found successful elsewhere.

SPRAYGUN RECRUITMENT FAILS

The Merit System of Kansas has just completed an experiment in the value of recruiting medical health officers through widely distributed announcements. From material in preparation for the forthcoming directory of the American Medical Association 3,500 names were selected to receive a "Wanted at Once! Health Officers" announcement. Those selected were made up of physicians listed with an M.P.H. degree, those holding public health positions, those licensed to practise in Kansas, and a random selection of others.

In addition the announcement was sent to schools of public health, medical schools, and medical journals. Although this was a more carefully selected list than is usually used for similar Civil Service announcements, only one application was received and no candidate selected through this source. It reenforces what has been found in other experience, that specialized professional personnel recruitment cannot be successfully done through mass methods that work relatively well for clerical and subprofessional personnel.

TRAINING FOR INDUSTRIAL HEALTH

The University of Michigan School of Public Health and the General Motors Corporation have established a postgraduate training program in industrial health, said to be the first of its kind in the country. Under this program which compares with the resident hospital training in other fields of medicine, General Motors offers a year's employment to young physicians who have completed their interneships; 8 months will be spent in the corporation's medical department working with experienced industrial physicians and technicians; 4 months in the school of public health studying basic introductory courses in public health administration, epidemiology, and health economics.

The program was worked out by Henry F. Vaughan, Dr.P.H., dean of the school, C. D. Selby, M.D., resident lecturer in industrial health and former GM medical director, and Max R. Burnell, medical director, General Motors Corporation (General Motors Building, Detroit) to whom application should be made.

Physicians interested in industrial health work who have completed their interneships in an approved hospital are eligible. Those currently serving their

interneships may begin the program after July 1, 1950.

USE, DON'T BURY YOUR TALENTS

One state Merit System Council has analyzed how the state's health department is applying the salary plan set up for the department. This salary plan calls for salary advancements in five permissible steps at 6 month intervals, thus providing for the top salary of the grade at the end of 2½ years. The plan calls for advancement each 6 month period upon determination of the agency, providing money is available and the employee is deserving.

An analysis of the salaries and tenure of the 162 employees of the department, however, reveals that only 11 of the 100 employees who have been in the department 2½ years or longer were receiving the highest salary. Of the 11, 2 had been employed between 3 and 4 years, 9, 5 years or longer.

The Merit System Council in its report suggests that such limited use of the salary range has led to lower employee morale and efficiency and to high turnover. If the typical Merit System employee cannot expect regular salary increases if his work is satisfactory "the good employee will resign, the average employee will become dissatisfied, and the below average employee will remain."

It recommends a review of the situation with proper recognition for individual service. It recommends further that definite policies be established for the consideration and granting of salary increases, that these policies be put in writing and made generally known, and that the effects of the policies be continuously evaluated.

Are there other administrators who are burying their talents instead of putting them to work to multiply twofold in the Biblical manner?

AN IDEA FOR PUBLIC HEALTH TOO

A brief news note in a mental health bulletin tells of a project that could be repeated indefinitely in various fields. It is reported here in the hope that someone will find just the right group and the right approach to get a similar service for public health.

The news note is: "Recognizing the need for more nurses trained in mental health principles, the General Federation of Women's Clubs has approved a scholarship program for training psychiatric nurses at the Norton Memorial Hospital, Louisville, Ky. They hope that each State Federation of Women's Clubs will provide one $500 scholarship to a registered nurse for a six month's course in the psychiatric unit of the hospital."

It will also be remembered that the *Journal* some months ago (*A.J.P.H.* 38, 10:1490) reported a program of scholarships for specialized training in cerebral palsy by a national college sorority—$5,000 a year for training 8 persons each year for 6 years and a $10,000 grant by another sorority for publication of a directory of equipment for the treatment of palsied children.

In other words, it is apparently still true that "Where there is a will, there is a way."

Will some member of the Association or of its Salary Subcommittee find the purse, or better, purses, and the key to opening them for public health training fellowships?

Credit Lines

BIBLIOGRAPHY OF PUBLIC HEALTH MOTION PICTURE AND FILM STRIP CATALOGS

The accompanying list is the second annual bibliography of health film catalogs and general catalogs listing films on health subjects. It was originally prepared at the suggestion of the Committee on Public Health Films of the Public Health Education Section of the American Public Health Association, and assembled by Thomas C. Stowell, Assistant Director, Office of Public Health Education, New York State Department of Health, and Anne J. Edmund, Health and Welfare Division, Metropolitan Life Insurance Company.

The present listing contains additional titles and information, and dates of publication, when available, but is not offered as complete either in content or form. Recommendations for improvements, corrections, or additions may be sent to Mr. Stowell at 18 Dove Street, Albany 6, N. Y.

General Catalogs

"Audio-Visual Resources for Health and Welfare" (1950 Edition)
"See and Hear" (Magazine), 812 No. Dearborn St., Chicago 10, Ill.

"The Blue Book of 16 mm. Films for 1949" (Formerly titled "1000 and One, the Blue Book of Non-Theatrical Films") The Educational Screen, Inc., 64 E. Lake St., Chicago, Ill.

"Educational Film Guide" (1949—with frequent supplements)
H. W. Wilson Company, 950 University Ave., New York 52, N. Y.

"Educators Guide to Free Slide Films" (First Annual Edition, 1949)
Educators Progress Service, Randolph, Wis.

"Guide to U. S. Government Motion Pictures"
U. S. Library of Congress, Washington 25, D. C.
(Published in June, 1947, but Motion Picture Division was liquidated July, 1947)

"A New Series of Motion Pictures Sponsored by the United Nations Film Board"
Department of Public Information, The United Nations, Lake Success, New York, N. Y.

"U. S. Government Films for School and Industry"
United World Films, Inc., (Castle Films Division) 1445 Park Ave., New York 29, N. Y.

Specialized Catalogs

Educational

"A Catalog of Certified Professional Motion Picture Films" (1948—supplement 1949)
Academy-International of Medicine and Dentistry, Department of Audio-Visual Aids, 214 W. Sixth St., Topeka, Kans.

"Dental Health Education Material" (1949)
American Dental Association, 222 E. Superior St., Chicago, 11, Ill.

"Films"
American Association for Health, Physical Education and Recreation, National Education Association, 1201 16th St., N.W., Washington 6, D. C.

"Films for Classroom Use" (Sept., 1948—new issue expected 1950)
Teaching Film Custodians, Inc., 25 W. 43rd St., New York 18, N. Y.

"Films That Teach Health and Hygiene"
Institutional Cinema Service, Inc., 1560 Broadway, New York 19, N. Y.

"Health Films Catalog" (1947—supplement planned for 1950)
Educational Film Library Association, 1600 Broadway, New York 19, N. Y.

"Sources of Educational Films" (Withdrawn, plan revision 1950)
National Education Association of the United States, 1201 16th St., N.W., Washington 6, D. C.

Medical

"Army Films on Medical Subjects"
Chief, Army Medical Illustration Service, Army Institute of Pathology, 7th St. and Independence Ave., S.W., Washington 25, D. C.

"A Catalogue of Certified Professional Motion Picture Films" (1948—supplement 1949)
Academy—International of Medicine, Department of Audio-Visual Aids, 214 W. Sixth St., Topeka, Kans.

"A List of Medical Films Which May Be Used in Professional Training" (Aug., 1947—Revision under way)
Medical Illustration Division, Research and Education Service, Veterans Administration, Washington 25, D. C.

"Medical Films That Teach"
Medical Film Guild, Ltd., 167 West 57th St., New York 19, N. Y.

"Medical Motion Picture Films" (1949)
American College of Surgeons, 40 East Erie St., Chicago 11, Ill.

"Medical Motion Pictures" (1949) (Also "Source List of Medical Motion Pictures," "Source List of Motion Pictures on Health," and "Reviews of Medical Motion Pictures," all 1949)
Committee on Medical Motion Pictures, American Medical Association, 535 N. Dearborn St., Chicago 10, Ill.

Safety

"Motion Picture Films of the Bureau of Mines" (1949–1950)
Office of Minerals Reports, Bureau of Mines, Department of the Interior, Washington 25, D. C.

"National Directory of Safety Films" (1948–1949)
National Safety Council, 20 N. Wacker Drive, Chicago 6, Ill.

Housing

"Films on Housing and Related Subjects" (1949)
Housing and Home Finance Agency, Public Housing Administration, Washington, D. C.

Nutrition

"Approved Films on Food and Nutrition" (1948)
New York City Food and Nutrition Committee, Health Council of Greater New York, 137 Centre St., New York 13, N. Y.

Business and Training

"Business-Sponsored Educational Films" (1949—$1.50)
Committee on Consumer Relations in Advertising, Inc., 420 Lexington Ave., New York 17, N. Y.

"General Electric Motion Pictures"
Visual Instruction Section, Publicity Division, General Electric Company, Schenectady, N. Y.

"General Motors Film Catalog" (1948–1949)
General Motors Corp., Department of Public Relations—Film Section, General Motors Building, Detroit 2, Mich.

Catalogs of Distributors

Association Films, Inc., (formerly Y.M.C.A. Motion Picture Bureau) 347 Madison Ave., New York 17, N. Y.
"Selected Motion Pictures, 1949–1950"

Audio-Visual Corp., 116 Newbury St., Boston 16, Mass.
"Educational Film Catalogue" (Vesco Film Library, Science Occupational Studies and Social Studies Sections)

Bailey Films, Inc., P. O. Box 2528, Hollywood 28, Calif.

Bell & Howell Filmosound Library, 1801 Larchmont Ave., Chicago 13, Ill.

Brandon Films, Inc., 1700 Broadway, New York 19, N. Y.
"Brandon Film List" (Oct. 1, 1949, with frequent supplements)

Bray Studios, Inc., 729 Seventh Ave., New York 19, N. Y.
"List of Educational Films Available on Rental or Purchase Basis" (1948–1949 with frequent supplements)

British Information Services, Film and Publications Division, 30 Rockefeller Plaza, New York 20, N. Y.

"Films from Britain—1949" (frequent supplements)
Edited Pictures System, 165 W. 46th St., New York 19, N. Y.
"Education and Entertainment by Motion Pictures"
Encyclopaedia Britannica Films, Inc., Wilmette, Ill.
"Encyclopaedia Britannica Films"
Film Center, 45 West 45th St., New York 19, N. Y.
"16mm. Sound Films 1950"
Walter O. Gutlohn, Inc., 25 W. 45th St., New York 19, N. Y.
Ideal Pictures Corp., 28 East 8th St., Chicago 5, Ill.
"Ideal Pictures" (1949)
Knowledge Builders, 625 Madison Ave., New York 22, N. Y.
"Knowledge Builders Film Service"
Modern Talking Picture Service, Inc., 9 Rockefeller Plaza, New York 20, N. Y.
New York University Film Library, 26 Washington Place, New York 3, N. Y.
"New York University Film Library 1949 Catalog 16 mm." (with frequent supplements)
The Princeton Film Center, Princeton, N. J.
"Catalogue No. 11"
Society for Visual Education, Inc., Chicago, Ill.
"Picturol Catalog" (Film strips)
United World Films, Inc., 1445 Park Ave., New York 29, N. Y.
"Catalog of 16 mm. Sound Motion Pictures"

Catalogs of Producers Who Are Also Distributors

Aetna Life Affiliated Companies, Motion Picture Bureau, Hartford 15, Conn.
"Aetna Educational Films"
Bray Studios, Inc. (See Catalogs of Distributors)
British Information Services (See Catalogs of Distributors)
Commercial Films, Inc., Training Films Division, P. O. Box 7, Cleveland, Ohio
"The Training Film Annual—Sound Slide Film Catalog" (1949, $1.00 applied toward orders)
Communication Materials Center, Columbia University Press, 2960 Broadway, New York 27, N. Y.
Coronet Instructional Films, Coronet Building, Chicago 1, Ill.
"Films by Coronet" (1948—supplements, 1949)
Encyclopaedia Britannica Films, Inc. (See Catalogs of Distributors)
Federal Security Agency, Public Health Service, Communicable Disease Center, Atlanta, Ga.
"Film Catalog—Utilization Guide" (Motion Pictures and Film Strips for professional and sub-professional groups, with individual pages for instructor use, which may be ordered separately)
Flory Films, Inc., 303 E. 71st St., New York 21, N. Y.
The Institute of Inter-American Affairs, 499 Pennsylvania Avenue, N.W., Washington 25, D. C.
"Catalog of Educational Films" (1949)
The March of Time Forum Films, 369 Lexington Avenue, New York 17, N. Y.
"The March of Time Forum Films"
McGraw-Hill Book Company, Inc., Text-Film Department, 330 West 42nd St., New York 18, N. Y.
"McGraw-Hill Text-Films on Health Education" (frequent News Bulletins)
National Film Board of Canada, 620 Fifth Ave., New York 20, N. Y.
"A Catalogue of Films" (1947—supplements)
"Films on Health and Welfare" (supplements and information sheets)
National Motion Pictures Co., Mooresville, Ind.
"Motion Picture Health Series" (Series of pamphlets, each descriptive of single film)
Willow Distributing Co., Inc., 551 Fifth Ave., New York 17, N. Y.
The World Today, Inc., 450 W. 56th St., New York 19, N. Y.
"Public Health Films" (1947–1948, with supplement)
Young America Films, Inc., 18 East 41st St., New York 17, N. Y.
"Descriptive List of 16 mm. Teaching Films" (1949)
"Descriptive List of Filmstrips and 2x2 Slides" (1949)

Magazines Containing General Information

Audio-Visual Guide
Educational and Recreational Guides, Inc., 172 Renner Ave., Newark 8, N. J.
Business Screen
Business Screen Magazine, Inc., 812 N. Dearborn St., Chicago 10, Ill.
Educational Screen
Educational Screen, Inc., 64 E. Lake St., Chicago 1, Ill.
Film Forum Review
Institute of Adult Education, Teachers College, Columbia University, and the National Committee on Film Forums, 525 W. 120 Street, New York 27, N. Y.
Film News
Film News Company, The Penthouse, 15 W. 38 St., New York 18, N. Y.
Film World
Ver Halen Publishing Co., 6060 Sunset Blvd., Hollywood 28, Calif.
Movie Makers
Amateur Cinema League, Inc., 420 Lexington Ave., New York 17, N. Y.
Scholastic Teacher
Scholastic Corp., 7 E. 12th St., New York 3, N. Y.
See and Hear, 812 No. Dearborn St., Chicago 10, Ill.
16 MM. Reporter
Andrew Publishing Company, Inc., 1819 Broadway, New York 23, N. Y.

Agencies Having Information on Films

The National Publicity Council, 130 East 22 St., New York 10, N. Y., maintains a collection of more than 1,000 health films exclusive of medical films for use in the elementary schools. Some of the health films are reveiwed in CHANNELS.

Many national agencies sponsor films relative to their fields of interest, such as, tuberculosis, heart, cancer, social hygiene, infantile paralysis, blindness, etc.

References for article by Brown, Cook, Ney and Hatch (p. 450)

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3. Brown, C. E. Studies in Dust Retention. III. Factors Involved in the Retention of Inhaled Dusts and Fumes by Man. *J. Indust. Hyg. & Toxicol.* 13:285, 1931.
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7. Landahl, H. D., and Herrmann, R. G. On the Penetration of Air-borne Particulates in the Human Lung. *J. Indust. Hyg. & Toxicol.* 30:181, 1948.
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10. Tourangeau, F. J., and Drinker, Philip. The Dust Filtering Efficiency of the Human Nose. *J. Indust. Hyg. & Toxicol.* 19:53, 1937.
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BOOKS AND REPORTS

All reviews are prepared on invitation. Unsolicited reviews cannot be accepted.

The Control of Communicable Diseases in Man—*An Official Report of the American Public Health Association (7th ed.). New York: A.P.H.A.*, 1950. 159 pp. Price, $.40.

The seventh (1950) edition of this invaluable handbook shows in a striking manner what can be accomplished by an alert and informed team of collaborators, building on a long established and well sustained tradition. The international scope of the handbook has been further extended. Over 5 pages of definitions serve to orient the reader to the exact meaning of concepts found in the text. A section specifically directed to "preventive measures" has been developed under each disease heading. New disease entities covered include echinococcosis, enterobiasis, serum hepatitis, kala azar, onchocerciasis, rickettsialpox, and African trypanosomiasis. The rickettsiae have been separated with a section for each species. Preference in terminology has been given an international emphasis (e.g., brucellosis, phlebotomus fever, rubella). *Salmonela paratyphi A, B, or C* may represent a nod to the international amenities, but "smallpox" still takes precedence over "variola." The merging of scarlet fever and streptococcal sore throat under one heading, and the use of the term "early reaction" instead of the older but misleading "immune reaction" under smallpox vaccination, are but two of many instances in which the handbook reflects advances in current knowledge in the field.

The handbook as a whole betrays the infinite care that must have obviously gone into its preparation. The few flaws stand out for their rarity; the omission of any mention of immunity to mumps, and the recommendation of "two adequate doses of diphtheria toxoid" (precipitated toxoid being implied but not specified) were noted. Also, one would have liked to see some mention of penicillin in aborting the convalescent carrier state in diphtheria, of the concept "ornithosis" and its relation to common water-fowl, and of the known methods of determining more accurately the optimal dose of gamma globulin in measles control.

These items, however, are trivial alongside the mass of invaluable, easily located, concrete, concise, and pertinent information which this handbook contains. It should be in the hands of everyone whose work is related to the control of communicable diseases.

GEOFFREY EDSALL

Staffing the General Hospital—25 to 100 Beds — *By Margaret K. Schafer. Washington: Federal Security Agency, Public Health Service, Division of Medical and Surgical Resources*, 1949. 20 pp.

Here is one of the first of what will probably be an ever increasing flow of bulletins issued by the Division of Medical and Hospital Resources, one of the new sections in the reorganized U. S. Public Health Service. It is a 20 page pamphlet filled with charts and tables listing the personnel needs of hospitals of 25, 30, 40, 50, 60, 70, 80, 90, and 100 beds. The author is a senior nurse officer in the Public Health Service who devotes a major portion of the work to the nursing personnel requirements, adjusting them for 40, 44, and 48 hour work weeks.

Particular pains have been taken by the author to point out that this is merely a *guide* to the staffing of small hospitals which constitute the bulk of all United States general hospitals (67 per cent) and the vast majority (85 per

cent) of the new hospitals at present being constructed under the Hill-Burton hospital construction program. Listed are some of the more important elements that make for individual differences in hospitals, such as size, arrangement, organization, community, and so on, which considerably influence personnel requirements. It is interesting to see the effect of the shortened work week on the nursing problem. Whereas 58 nurses, for example, are suggested for a 100 bed hospital on the 48 hour work week, 70 nurses are required for the same hospital on the 40 hour work week.

"These staffing guides were developed from one-day data collected in 22 selected hospitals of less than 100 beds in different parts of the United States." No details of the sample are given. It is, however, obviously very small and obviously very select. I doubt if many of our 3,000 small general hospitals today approach, for example, the 3.39 hours of nursing care per patient per day suggested for a 100 bed hospital, even though 50 per cent of this time represents non-RN attention. Listed, however, are the goals for adequate nursing care (the *quality* of care is not discussed in this pamphlet).

The tables and charts are clear and understandable. Hospital authorities who remember that they should be used only as guides will find considerable information of value in them.

J. H. GERBER

Simple Nursing; Illustrated Handbook—*By Wava McCullough assisted by Marjorie Moffett. New York: McGraw-Hill,* 1949. 238 pp. Price, $2.40.

With the increasing demand of the public for "stories in pictures," this book serves a purpose. It seems better suited, however, to home nursing study groups than to practical nurses, hospital attendants, beginning student nurses, or home economics students for whom it was primarily prepared. It is all too simple and would not gain respect as a permanent textbook by the student nurse in either grade—the registered nurse or the practical nurse student.

The sections on ward routine, bandaging and visual education are the best parts of the book. They are concise and leave out nothing. As we read page 22, we thought of the splendid opportunity which had been permitted to pass in emphasizing the fact that uniforms are for nursing only and not for street wear. In getting ready for a home call, for example, the street dress could have been at the head and not the foot of the list.

On page 80, the technique of using a rectal thermometer is good, but it fails to demonstrate a very important point, to hold the thermometer by hand until it has registered.

The illustrations having to do with stupes and poultices (page 137) could indeed be useful and the caption "Stop. Think!" could very well stand reproducing for posting purposes even though compiled in a negative fashion of writing.

The section giving instructions on how to learn to knit and crochet and the recipes for cooking would appear to be superfluous.

The book, however, is attractive in its light blue cover and illustrations resembling modern pen sketching.

ELIZABETH HALL

Clinical Diagnosis by Laboratory Examinations—*By John A. Kolmer (2nd ed.) New York: Appleton-Century-Crofts,* 1949. 1212 pp. Price, $12.00.

This book is divided into three parts, dealing respectively with the clinical interpretation, the practical application in clinical diagnosis, and the technic of laboratory examinations. This has made possible the presentation of material from three points of view. First, normal findings and the clinical conditions in which deviations from normal occur are considered. The first half of the book

covers the multitudinous cytologic, chemical, physical and microbiological, etc., examinations done in the modern clinical laboratory, with interpretation of each. The second part reverses the approach by giving consideration to the laboratory findings in specific disease conditions. Finally, in the third part, the technics of the specific tests are described in detail.

This second edition includes extensive revision with numerous additions. The author has achieved remarkable success in bringing the text up to date. Even bacteriological nomenclature has been brought into line with Bergey's most recent edition.

Diagnostic tests for viral and rickettsial diseases are described. Rh and Hr blood factors, Papanicolaou's cytology test for cancer and homologous serum jaundice are examples of developments of recent years that are added in this edition. Technics are precisely and clearly described.

This book is excellently printed, contains a most adequate table of contents, list of diagnostic summary tables, and index. It is bound to withstand the rigors of extensive usage that it will inevitably receive whether in the office of the practising physician, the health department, or in the laboratory. Certainly every public health and clinical laboratory should have available a copy of this reference book. M. H. MERRILL

Government of Cities in the United States—*By Harold Zink. (rev. ed.). New York: Macmillan,* 1948. 637 pp. Price, $5.00.

The author justifies revising this textbook first written a decade ago on two main bases; the significant changes in the field of municipal government in the last two decades and certain new trends in the teaching of political science. He thus devotes a good deal of attention to the relation of cities to state, federal, and county governments as well as to neighboring town and village governments.

A number of chapters are devoted to citizens' organizations and their influence upon city government—pressure groups, political organizations, and others.

It is interesting to note that the author finds evidence of what has also been found in industry; that beyond a certain point, bigness in cities increases rather than decreases overhead. For example, Greencastle, Ind., with fewer than 5,000 inhabitants, has one policeman per 975 persons; Indianapolis, one per 600; Chicago, one per 500; and New York, one per 475.

The book is well organized for use as a textbook on the college level, uses a minimum of high-flown language, and is printed on a good grade of paper. Among its values is a carefully selected bibliography at the end of each chapter.

MARTHA LUGINBUHL

Getting Along in the Family—*By Jane Mayer. New York: Bureau of Publications, Teachers College, Columbia University,* 1949. 44 pp. Price, $.60.

Providing in today's mechanized home a rich and fertile environment for the growth of healthy and resilient personalities is the theme of this pamphlet. It is addressed primarily to parents and teachers, being one of the Parent-Teacher Series from the Columbia University Teachers College, but it should be just as useful to social workers, public health nurses, and public health educators, in their work with families and with study groups. It is about as easy to read as comparable writings in newspapers and in women's magazines, and it is agreeably illustrated with sketches of the cartoon type.

In fitting this profound and complex subject into 44 pages, the emphasis has wisely been placed on the child rather than on the parents, and on the young child rather than on the adolescent. The goal is to have the parents pull together

to make the family a warm center in which activities and interests are shared, and in which each member feels needed and appreciated—without either perfectionism or martyrdom. Generous use is made of concrete examples of ways in which these things may be accomplished, and there are specific discussions of such events as birthdays, Christmas, and the arrival of a new baby.

LEONA EAST CULP

Industrial Toxicology — *By Alice Hamilton and Harriet L. Hardy. (2nd ed. revised and enlarged). New York: Hoeber,* 1949. 574 pp. Price, $6.50.

The first edition of this book written by Dr. Alice Hamilton was published in 1934. It met with the immediate approval of industrial hygienists and physicians interested in industrial toxicology.

The present volume is an elaboration of the first edition, with the addition of new chapters, the most important of which deal with beryllium, synthetic rubber, plastics, and stilboestrol.

The book is wide in scope, including the metals, asphyxiants, the aromatic series, the aliphatic series, chlorinated compounds, synthetic rubbers, plastics, occupational cancer of the skin, lungs and bladder, radiant energy and stilboestrol.

Very wisely, in the opinion of the reviewer, the material is not treated in a uniform manner with respect to every substance, the outline being varied and depending on the substance at hand. As a rule, the source of the toxic agent is discussed, the manifestation in acute and chronic cases and the method of control set forth. An appreciation of the scope and detail of the presentation may be gained by the fact that some 1,300 references are critically digested and presented in the bibliography.

The literature of industrial toxicology is to be found widely dispersed in many books and periodicals. For this reason it is particularly valuable for the industrial hygienist and the practitioner of medicine to have at hand a volume such as the present one. As a reference book for those interested in the field of industrial hygiene and toxicology, this volume is highly recommended. No industrial hygiene library can be considered complete without it and physicians who only occasionally see a case of industrial poisoning should possess this volume for rapid, ready reference.

LEONARD GREENBURG

Rehabilitation of the Handicapped —*A Survey of Means and Methods. Edited by William H. Soden. New York: The Ronald Press,* 1948. 399 pp. Price, $5.00.

The increasing awareness of public health workers in the field of rehabilitation makes this book timely. The topics are inclusive and the authors well chosen for those in related fields who wish to acquire some knowledge of rehabilitation. Forty-five specialists describe thirty-eight aspects of rehabilitation. Included are general medical and surgical technics, the neurological methods, developments in the field of psychiatry, vocational and social rehabilitation, and educational and psychological trends. Community aspects are well emphasized, with descriptions of community workshops, Alcoholics Anonymous programs, rehabilitation centers, good will industries, the use of volunteer workers and even the psychological aspects of rehabilitation. This is highly recommended reading for public health workers.

REGINALD M. ATWATER

Industrial Microbiology—*By Samuel Cate Prescott and Cecil Gordon Dunn. (2nd ed.). New York: McGraw-Hill,* 1949. 923 pp. Price, $8.50.

From a moderately sized book of 541 pages, the *Industrial Microbiology* of 1940 has grown in 9 years to a heavy encyclopedia of 923 pages. Fully re-

vised and amplified with the newer knowledge, it is a comprehensive review of all aspects of fermentation and related processes in industrial operation. The book will guide the food and drug inspector and the worker in the public health laboratory. The treatment of the industrial microbiologic principles and operations is thorough. The inclusion of data on the biochemistry of fermentation is more elaborate than in the first edition and adds greatly to the value of the book. The chapter on antibiotics, covering 100 pages, is a well balanced presentation of a subject which public health workers should read in order to appreciate the genius of the "know how" behind the package of a drug continuously in use to fight infections.

Among the industrial processes involving microbiology which deserve consideration in future editions may be mentioned such topics as fermentation of bread and baking, vanilla bean curing, and tea curing. Those interested in food would appreciate a more complete discussion of the general microbiological processes involved in spoilage. Some mention of preservatives to arrest or prevent microbial attack of wood might be of general interest. The selection of the bibliography at the end of each chapter has been done with great care, consequently the footnote references are an unnecessary duplication.

K. F. MEYER

For the New Mother—*By Mildred V. Hardcastle. Philadelphia: Winston,* 1948. 163 pp. Price, $2.00.

"How to keep house with a first baby" would be a good subtitle for this book. In an easy conversational style, Mrs. Hardcastle gives advice to young mothers on the "how" and "when" of caring for a baby in a comfortable household setting without a maid. Easy access to a physician for supervision of both mother and baby is presupposed — in fact, she gives suggestions on what symptoms justify calling the physician during the night, what calls can wait for the physician's preferred hour, and what questions can ordinarily be saved for the next regular visit. This matter, however, like everything else in the book, is to be subject to the physician's wishes. She tells the new mother to "choose your baby's doctor with the utmost care and then have faith in him," despite how other doctors may manage neighbor's babies or what is read.

Mrs. Hardcastle's own psychology might be described as common sense, practical permissiveness, and her book is planned to give anticipatory guidance to the mother who reads it.

She is extremely practical, also, in her approach to the mother's own physical and psychological problems. The suggestions on how to plan housework, baby care, and recreation include simple menus and quick recipes, and discussions of inexpensive and fascination-sounding hobbies.

It is just the book for the young, intelligent primipara who would be the public health nurse's star patient but who has such a low priority in the public health nurse's case load that she is seldom actually reached—perhaps reached only to have this book recommended to her. FRANCES ROTHERT

Group Medicine and Health Insurance in Action—*By Robert E. Rothenberg, Karl Pickard, and Joel E. Rothenberg. New York: Crown,* 1949. 278 pp. Price, $5.00.

This book is an unusual and important contribution to the field of medical care. For the first time the origin, development, organization, and experience of a group practice unit operating under prepayment is presented in detail. There is a wealth of practical experience recorded here for the use of any physician or layman interested in the structure and function of group medical practice. Detailed data are provided on

legal aspects, requirements for medical personnel, medical standards, administrative, auxiliary, and clerical personnel, physical requirements, and business organization. The group is shown in action, data on utilization and types of service are provided, and there are excellent reviews of experience with respect to patient-doctor relationships and the relationships of the group to the plan and the community. Public health workers will be particularly interested in the discussion of the preventive and educational aspects of the group's activities.

The Central Medical Group of Brooklyn, affiliated with the Health Insurance Plan of Greater New York, is the protagonist and, in a sense, the collective author of the story. The authors write with enthusiasm, hold the reader's interest, and present facts, figures, and experience in warm, human terms. The problems of the group receive thorough discussion, and the advantages and disadvantages of group medical practice, both to the physician and the patient, are carefully explored. The authors conclude that "after two years of living with this medical experiment, there can be no question in the minds of the participants that advantages far outweigh disadvantages."

There are some minor criticisms which deserve noting. The introductory historical review of health insurance plans is far too sketchy to be of value, and the plan for national voluntary health insurance outlined in the concluding chapter appears somewhat unrealistic. Also, the critique of H.I.P. estimates of requirements for medical personnel and of group physicians' incomes seems questionable, since the group admittedly does not devote full time to H.I.P. patients.

These, however, are minor flaws. The bulk of the volume represents a source of much valuable information. The book is highly recommended, and it is hoped that the many sided experience of other groups in and out of H.I.P. will soon be brought to professional and public attention. MILTON TERRIS

Advances in Pediatrics — *Vol. 4. Edited by S. Z. Levine and Others. New York: Interscience,* 1949. 316 pp. Price, $6.50.

This volume maintains the high standards of authorship and format set by three previous ones. It has been enhanced by giving recognition to three outstanding foreign contributors, each a specialist in his field. This review does not admit of detailed consideration of each of the comprehensive monographs which present systematically recent methods of diagnosis and advances in prophylaxis and therapy. Four of the chapters bear directly or indirectly upon preventive medicine and public health.

Chapter One on Diet in Diabetes in Childhood, by A. Lichtenstein of Stockholm, Sweden, records his clinical observations and research from which he concludes that "diabetes can generally be controlled with ease by insulin only, and without imposing any dietetic restrictions" and that "diabetic children on a 'free diet' grow and develop in a normal way." An excellent chapter on the Treatment of Congenital Syphilis by Penicillin, by Ralph V. Platou of New Orleans, concludes that "for the present, it seems enough to state that penicillin is the best single agent which has yet been employed for the treatment of congenital syphilis in infants or children."

The monograph on Erythema Nodosum, by Ruth T. Gross and Rustin McIntosh of New York City, is a careful, systematic presentation of the subject with diagnostic criteria which "brings to the fore the concept that erythema nodosum is an episode of hypersensitiveness which reflects an allergic response to a specific agent—usually an infection, occasionally a drug." The chapter on The Reticulo-

endothelioses in Children, by Sture Siwe of Lund, Sweden, reveals an intimate knowledge of this subject and gives helpful diagnostic signs and symptoms of the disease.

From the standpoint of public health the chapter on Combined Immunizations, by Joseph H. Lapin with collaboration of Manfred Weichsel of New York City, should be thoroughly studied by every pediatrist and general practitioner. It is a detailed as well as comprehensive treatment of the entire subject, covering practically every phase.

The sections on Judging Diphtheria, Tetanus and Pertussis Immunities, together with the Evaluation of Multiple Immunizations, are practical and exceedingly helpful.

Drs. Franc D. Ingrahm and Donald D. Matson of Harvard Medical School have rendered the profession valuable service in reviewing the extensive literature on Subdural Hematoma in Infancy and of analyzing their experience in the treatment of a series of 169 cases under 2 years of age occurring in their practice.

All in all this volume can be recommended as excellent reference material on the various subjects presented.

RICHARD ARTHUR BOLT

United States Public Health Service: The Chicago-Cook County Health Survey. *New York: Columbia University Press,* 1949. 1317 pp. Price, $15.00.

The Public Health Service provides, in this volume, the full report of the huge survey it conducted in Chicago and Cook County. The earlier summary was reviewed in the *American Journal of Public Health,* 37:1603 (Dec.), 1947. Although conducted by the Public Health Service, the survey "represents a landmark in the evaluation of coöperative community enterprises." The survey and report are of unusual importance because it is one of very few comprehensive surveys of a major metropolitan area; it was conducted by an official agency; the subjects covered are very broad, including such titles as, environmental sanitation, industrial hygiene, preventive medicine, mental hygiene, personnel practices, voluntary health agencies, medical care, and care of the chronically ill.

The volume provides a detailed study of large urban public health administration by the case study method which fills a real need in an area where the literature is deficient. Although the standards suggested or the recommendations may not be applicable immediately, the report can be a valuable guide to other comparable areas. The content necessarily contains both facts and the philosophies of a variety of persons, so that it must be used judiciously, but will be of real service to serious students of public health.

ROSCOE P. KANDLE

Textbook of Virology—*By A. J. Rhodes and C. E. van Rooyen. New York: Nelson,* 1949. 312 pp. Price, $5.00.

The primary aim of this book is to present the essential features of virus and rickettsial diseases of man to the medical student and the practitioner. It is not designed for the laboratory worker or the specialist in virology who will find it incomplete for his needs. There are no references and students desiring advanced reading must look elsewhere.

The introductory chapters are especially valuable for those not familiar with this field. The economic importance of the agents, their classification and fundamental properties, technical methods and apparatus used in virus research are presented in an extremely readable form. The latter chapter describes light microscopy as used for the examination of elementary bodies, staining methods, electron microscopy, with diagrams explaining structural details, filtration, centrifugation, and tissue cultivation,

including very clear descriptions of the application of fertile egg technique to virology. Next are presented brief chapters on immunity mechanisms, interference phenomena, methods of spread, and the nature of viruses.

The balance of the book consists of short chapters on various diseases which are grouped, with some exceptions, under exanthemata, respiratory diseases, arthropod-borne tropical fevers, neurotropic diseases, insect-borne encephalitides, and rickettsial infections. Each disease is briefly described as to clinical aspects, pathology, diagnosis, etiology, epidemiology, method of spread, specific treatment, prevention and immunity. The important diseases are treated at much more length than are others whose rarity or relative benignity make them less significant. This book is exceptionally well illustrated with many figures, diagrams, and photographs, and is also well indexed. GORDON C. BROWN

Better Care in Mental Hospitals. *Proceedings of the First Mental Hospital Institute of the American Psychiatric Association, Office of Medical Director, American Psychiatric Association, Washington, D. C.*, 1949. 208 pp.

The Mental Hospital Institute was held April 11 to 15, 1949. The form was primarily that of discussion groups under leaders carefully selected so as to be able to introduce subjects and bring up questions but not to stifle discussion with long speeches. The Institute was largely planned by the Executive Director of the American Psychiatric Association and was a foretaste of what can be expected from the full-time employment of a capable leader in such a position. This is an old story for the members of the A.P.H.A., but a very new one for the Psychiatric Association which, until 1948, had no professional directive staff.

The Institute was organized around central topics: Administration, Relations between Hospitals and Community, Personnel, and Clinical Relations in the Hospital. All members attended all sessions, which meant long and serious work every day. Fatigue was given very little attention and apparently did not interfere with the productiveness of the group; the final sessions appear in the reports as full of spontaneity as the earlier ones. Only once is it noted that a question was thrown out after which it had to be recorded that there was no response.

While there are many technical questions in the field of psychiatry brought up in this work, there are more that have great interest for the medical administrator generally. The problems of the administrative organization of a staff, of how many people should report to the administrative head, whether it is necessary that the top man be a physician and a psychiatrist, the place of staff meetings in morale, the uses of inservice training for keeping personnel satisfied and at a level of maximal usefulness to patients are all discussed. A particularly penetrating analysis of the problems presented by the inadequate supply of nurses, together with some stimulating and radical ways of solving them, will be found in the section on personnel. While it is extremely difficult to give a single quotation that will indicate the flavor of any book, much less one to which a very large number contributed, one quotation will be risked. "The very enormity of our problems tends to make us increasingly insensitive . . ." "A hospital in this country, internationally known, has at times a clerk-typist taking this (identifying) material from a patient who might be crying, agitated, or depressed. I have seen such a clerk-typist, pounding away at a typewriter, entirely oblivious except to the data about how old the patient is and when and where born, and then telling the patient to go down the hall two doors to the right. That is the

opening treatment in an internationally known hospital in this country, a psychiatric hospital." Such self-criticism could be applied elsewhere in medicine as well as in psychiatry.

The stenographic report of the Institute was cut about in half in the preparation for this book, but the report is not disjointed. The cutting was skillfully done. The speeches recorded have similarly been radically pruned so that the book represents a highly concentrated intellectual and emotional meal.

PAUL V. LEMKAU

BOOKS RECEIVED

BIBLIOGRAPHY OF OCCUPATIONAL MEDICINE. Vol. I, 1948. Washington: International Labor Office, 1950. 93 pp. Price, $1.00.

BRUCELLOSIS. (Undulant Fever) 2nd ed. Harold J. Harris. New York: Hoeber, 1950. 617 pp. Price, $10.00

CAMP DIRECTOR'S HANDBOOK AND BUYING GUIDE. Official Publication American Camping Asso. Plainfield, N. J.: Galloway Publishing, 1950. 114 pp. Price, $1.50.

CIVIL DEFENSE PLANNING ADVISORY BULLETIN. Washington: National Security Resources Board, 1950. 8 pp.

COMMUNITY HEALTH ORGANIZATION. 4th ed. Ira V. Hiscock. New York: Commonwealth Fund, 1950. 278 pp. Price, $2.75.

DAMAGE FROM ATOMIC EXPLOSION AND DESIGN OF PROTECTIVE STRUCTURES. Prepared by the Department of Defense and the U. S. Atomic Energy Commission. Washington: National Security Resources Board, 1950. 40 pp. 2 illus.

FAMILY FARE. Food Management and Recipes. Home and Garden Bulletin No. 1, U. S. Department of Agriculture. Washington: Supt. of Doc., 1950. 96 pp. Price, $.25 in coin.

FAMILY LIMITATION AND ITS INFLUENCE ON HUMAN FERTILITY DURING THE PAST FIFTY YEARS. Papers on the Royal Commission on Population Vol. I. New York: British Information Services, 1949. 202 pp. Price, $1.00.

FEDERAL FOOD, DRUG, AND COSMETIC ACT. 1938–1949. Vincent A. Kleinfeld and Charles Wesley Dunn. Chicago: Commerce Clearing House. 895 pp. Price, $17.50.

INTERSTATE SANITATION COMMISSION, REPORT. NEW YORK, NEW JERSEY, CONNECTICUT, 1949. New York: Interstate Sanitation Commission, 1950. 36 pp.

INTRODUCTION TO PSYCHIATRIC NURSING. Marion E. Kalkman. New York: McGraw-Hill, 1950. 336 pp. Price, $3.75.

JEALOUSY IN CHILDREN. A Guide for Parents. Edmund Ziman. New York: Wyn, 1949. 236 pp. Price, $2.75.

LOUIS PASTEUR. Free Lance of Science. Rene J. Dubos. Boston: Little, Brown, 1950. 418 pp. Price, $5.00.

MEDICAL ASPECTS OF ATOMIC WEAPONS. Prepared for the National Security Resources Board by the Department of Defense and the U. S. Atomic Energy Commission. Washington: Gov. Ptg. Office, 1950. 24 pp. Price, $.10.

METHODS AND MATERIALS IN ELEMENTARY PHYSICAL EDUCATION. Edwina Jones, Edna Morgan and Gladys Stevens. Yonkers-on-Hudson, N. Y.: World Book Company, 1950. 258 pp. Price, $3.00.

MICROBIOLOGY OF FOODS, LABORATORY MANUAL AND WORK BOOK. Fred W. Tanner. Champaign, Ill.: Garrard Press, 1950. Price, $4.75.

NATIONAL ASSOCIATIONS OF THE UNITED STATES. U. S. Department of Commerce. Washington: U. S. Gov. Ptg. Office, 1949. 634 pp. Price, $3.50.

ORTHOPEDIC APPLIANCES, PROCEEDINGS OF THE FIRST ANNUAL SYMPOSIUM. Mellon Institute and the Department of Orthopedic Surgery, School of Medicine, University of Pittsburgh, September, 1948. Washington, D. C.: Orthopedic Appliance and Limb Manufacturers Association, 1950. 308 pp. Price, $5.00.

OCCUPATIONAL EYE DISEASES AND INJURIES. Joseph Minton. New York: Grune & Stratton, 1949. 184 pp. Price, $4.50.

PERSONALITY. DEVELOPMENT AND ASSESSMENT. Charles M. Harsh and H. G. Schrickel. New York: Ronald Press, 1950. 518 pp. Price, $5.00.

POINT FOUR. Cooperative Program for Aid in the Development of Economically Underdeveloped Areas. $.40, and POINT FOUR PROGRAM. $.15. Prepared by the Department of State. Washington: U. S. Gov. Ptg. Office, 1950. 167 pp.

PUBLIC HEALTH IN KOREA. Chai Chang Choi. Seoul, Korea: Economic Cooperation Administration Mission in Korea, 1949. 66 pp.

PREMATURE BABY, THE. 2nd ed. V. Mary Crosse. Philadelphia: Blakiston, 1950. 167 pp. Price, $2.75.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

Pray the Gains Will Continue—If for nothing else you'll want this paper in your "indispensable" file for the graph revealing our astonishing increase in life expectancy, decade-by-decade. There is a lot more.

ANON. Health and Longevity at the Mid-Century. *Statist. Bull. Metrop. Life Insur. Co.* 31, 1:1 (Jan.), 1950.

Science without Pain—Not alone for what he says, but for the delightful way a British scientist says it, this first of three papers is earnestly commended to you. Just one quote! "Indeed, I was rather expecting that I should be required to abjure not only communism and polygamy but also the virus theory of cancer before being allowed to land in this country." Even though the succeeding issues achieve even higher degrees of readableness, they will not be mentioned in this literary sieve for busy hygienists—so be forewarned.

ANDREWS, C. H. Adventures Among the Viruses. *New England J. Med.* 242, 5:161 (Feb. 2), 1950.

Nice Going—These are the things New York is doing to promote better care for premies: setting standards of care, developing premie centers, providing transport, developing training courses, providing for home care, and continuing to study the city-wide picture. Seems like a good plan, doesn't it?

BAUMGARTNER, L. The Program for Prematurely Born Infants in New York City. *New York State J. Med.* 50, 3:289 (Feb. 1), 1950.

Just a Thought—As we become an older people periodontal diseases cause more and more tooth losses, so like the prevention of caries, this field too seems to be in the way of becoming a public health responsibility.

CHILTON, N. W. Some Public Health Aspects of Periodontal Disease. *J. Am. Dent. A.* 40, 1:28 (Jan.), 1950.

Wholesale Medical Care—This is the story of a random sampling of the 200 patients who came for care to 10 different medical groups just prior to the study. It suggests that statistical indices of kinds and amounts of medical services can be established but that critical examination is called for.

CIOCCO, A., *et al.* Statistics on Clinical Services to New Patients in Medical Groups. *Pub. Health Rep.* 65, 4:99 (Jan. 27), 1950.

Watch Out for Reactions—This you probably know about if you have anything to do with Schick testing: "the reaction to the ordinary Schick test, when positive, is not a completely reliable index of susceptibility to diphtheria."

COHEN, P., *et al.* False Positive Reactions to the Schick Test. *J.A.M.A.* 142, 6:390 (Feb. 11), 1950.

Ground Work—It seems there are three groupings of polio viruses into which the 25 known immunologically different strains can be placed. There is more to this paper, but this is enough unsettling news for one item.

KESSEL, J. F., AND PAIT, C. F. Immunologic Groups of Poliomyelitis Viruses. *Am. J. Hyg.* 51, 1:76 (Jan.), 1950.

Laboratory—From a study in war-disrupted England come these conclusions: "the most important factor in the development of the infant mortality

rate is the standard of nutrition of the people and the most important factor in the tuberculosis rate is the standard of overcrowding."

LEFF, S. Poverty, Infant Mortality and Tuberculosis. *M. Officer.* 83, 5:45 (Feb. 4), 1950.

Remedy for Positive-itis — This paper is about nutrition in disease but it will do you a lot of good to read it even though your concerns are limited to nutrition in health. Just the recurring refrain, "the belief . . . has no basis in fact" should do you a lot of good!

MANN, G. V., AND STARE, F. J. Nutritional Needs in Illness and Disease. *J.A.M.A.* 142, 6:409 (Feb. 11), 1950.

"Tell the Truth, and . . ."—In spite of vast differences in cancer "control" programs, trends in cancer mortality are alike from (Canadian) province to province. Gloomily the writer concludes that the findings support the old contention that it is the nature of the neoplasm not the time of treatment that determines the outcome.

MCKINNON, N. E. Cancer Mortality Trends Under Different Control Programs. *Canad. Pub. Health J.* 41, 1:7 (Jan.), 1950.

Guidance Still Needed—Here you will find a clear statement of what penicillin has done to the present-day problem of controlling gonorrhea and syphilis. It cures the cases, as you know, but it won't of itself wipe out the diseases.

NELSON, N. A. Modern Venereal Disease Control. *Am. J. Nursing* 50, 2:75 (Feb.), 1950.

Call to Arms—We have the means to reduce the shortage of tuberculosis hospital beds. Aggressive action by local health officials and tuberculosis workers is what is now needed to bring the nation-wide program to fruition. Where 2.5 beds per annual death are needed, only 1.4 acceptable beds exist.

REED, L. S., AND BLOMQUIST, E. T. Tuberculosis Facilities and Planning Under the Hospital Survey and Construction Act. *Pub. Health Rep.* 65, 5:147 (Feb. 3), 1950.

"A Corporate Responsibility"—The Surgeon General urges industrial managers to do more about the health of employees and then suggests that they assume more responsibility for the adequacy and quality of community health services.

SCHEELE, L. A. Industrial Hygiene. A New Frontier in Public Health and Industry. *Modern San.* 2, 2:19 (Feb.), 1950.

Personal Note — Here's a hint for hoary hygienists. In youth, deficient utilization of bone-forming minerals slows growth. That, you know. It is possible that similar deficiencies in adult life may hasten senescence. Better watch your minerals!

STEARNS, G. Human Requirements of Calcium, Phosphorus and Magnesium. *J.A.M.A.* 142, 7:478 (Feb. 18), 1950.

Hit-or-Miss Department—From a hurried skimming of three British epidemiologic studies one finding sticks in my memory. Influenza A can be isolated readily in high peak years, less readily in lower peak years, and hardly ever in the in between years of low mortality. I forget the moral.

STUART-HARRIS, C. H., AND TYRELL, D. Deaths from Influenza. A Statistical and Laboratory Investigation (and two related papers.) *Brit. M. J.* No. 4648, p. 263 (Feb. 4), 1950.

"Disabled on Day of Visit"—Here's a statistic that *is* a statistic: on an average week day in February, 1949, about 4½ million working-age people were laid up by illness. There are, of course, many more findings in this study.

WOOLSEY, T. D. Estimates of Disabling Illness Prevalence in the United States. *Pub. Health Rep.* 65, 6:163 (Feb. 10), 1950.

ASSOCIATION NEWS

SEVENTY-EIGHTH ANNUAL MEETING
AMERICAN PUBLIC HEALTH ASSOCIATION
ST. LOUIS, MO., OCTOBER 30–NOVEMBER 3, 1950

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

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Mohamed Iliyas, M.R., D.P.H., 55 Shattuck St., Boston 15, Mass., Student, Harvard School of Public Health

Linden E. Johnson, M.D., U. S. Marine Hospital, Neponsit, L. I., N. Y., Clinical Director

J. Louis McDougal, D.O., 8820 W. Seven Mile Road, Detroit 21, Mich., Director of Brucellosis Control, Michigan Assn. of Osteopathic Physicians and Surgeons

R. L. Novy, M.D., 858 Fisher Bldg., Detroit, Mich., Private Practice

Carl E. Rice, M.D., 6500 Maple Ave., Chevy Chase, Md., Medical Consultant, Social Security Administration, F.S.A.

Naomi Riggs, M.S., 10 Burning Tree Court, Bethesda 14, Md., Medical Social Consultant, Division of Tuberculosis, P.H.S., F.S.A.

Malcolm Smith, B.S., Low Hall, North Brother Island, New York, N. Y., Administrative Resident, Montefiore Hospital

Rudolf Toch, M.D., 300 Longwood Ave., Boston 15, Mass., Research Fellow, Children's Medical Center

Unaffiliated

Lillian H. R. Bajda, B.S., 122 Milligan Place, South Orange, N. J., Sanitary Inspector and Registrar, Board of Health

Janet L. Blackweel, R.N., 102 Sussex Ave., East Orange, N. J., Student, New York Univ.

Jean M. DeForest, 2145 Massachusetts St., Lawrence, Kans., Accounting Clerk, Lawrence-Douglas County Health Dept.

Walter B. Dillon, 417 E. 13th St., Kansas City, Mo., Administrative Asst., U.S.P.H.S.

Katherine L. Jones, 313½ Duffy St., Charleston, W. Va., Personnel Officer, West Virginia State Dept. of Health

Robert J. Mackie, B.S., 724 W. Jackson St., Bloomington, Ill., Personnel Director, St. Joseph's Hospital

Robert S. Poos, M.D., M.P.H., U. S. Naval Hospital, San Diego, Calif., Officer in charge, Epidemic Disease Control Unit 5, U. S. Navy

James R. Wadsworth, V.M.D., Univ. of Illinois Veterinary College, Urbana, Ill., Instructor, Veterinary Anatomy

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OKLAHOMA PUBLIC HEALTH ASSOCIATION

The Annual Meeting of the Oklahoma Public Health Association "for all people interested in any phase of health as it relates to the individual or to the community" was held in the Municipal Auditorium, Oklahoma City, December 15–17 under the Presidency of M. L. Peter, M.D. This was the first meeting of the O.P.H.A. since it became affiliated with the American Public Health Association as the thirtieth affiliated society.

Speakers from out of the state included Martin Frobisher, Jr., D.Sc., of the Communicable Disease Center, Atlanta, Ga., and Vlado A. Getting, M.D., from the Massachusetts State Department of Public Health. Featured on the program were panels on "The Effects of Excessive Sugar Intake on General Health," and on "Health Councils."

The following officers were elected:

President—Peter H. Cramer
Vice-President—Mrs. Odessa Winters
Secretary-Treasurer—Marjorie Butler

PROPOSED AMENDMENT TO CONSTITUTION OF THE SOUTHERN BRANCH, A.P.H.A.

Notice is hereby given of a proposed amendment to Article III of the Constitution of the Southern Branch, American Public Health Association. New material is italicized; material to be deleted is shown in parentheses.

Article III Governing Council

There is hereby created a Governing Council, the personnel of which shall be constituted as follows:

(a) no change

(b) one active member of the Southern Branch of the American Public Health Association from each of the sixteen (Southern) states *as listed in Article I of of the By-laws,* (and) *from* the District of Columbia (comprising the Southern Branch), *and from any Latin American country which is officially recognized as part of the territory of the American Public Health Association, and which applies and is accepted by the Southern Branch of the American Public Health Association.* These members to be selected by the Public Health Association of the respective state or area or, if no such Association exists, by the executive health officer of the state or area. Alternate Councilors selected in the same manner may serve in the same capacity in the absence of the Councilor. Organization is to be effected as follows: Nine, one from each of the first nine states in alphabetical order to serve for one year; eight, one from each of the remainder of states and area, to serve for two years; thereafter, the term of each councilor shall be two years and until his successor has been selected. The term of office shall begin with the close of an annual meeting.

No change in balance of article.

The Constitution of the Southern Branch may be amended by a two-thirds vote of the active members present at an annual meeting. The next meeting will be held in Birmingham, Ala., April 27 to 29.

JOURNAL ON MICROFILM SERVICE

The Association has entered into an agreement with University Microfilms, Ann Arbor, Mich., to produce and distribute copies of the *American Journal of Public Health* on Microfilm, particularly for the use of libraries. Microfilm makes it possible to produce and distribute an entire volume in a single roll at a cost approximately equal to the cost of binding the same material in a conventional library binding. The microfilming of the *Journal* begins with volume 39, January, 1949.

The microfilm is in the form of positive microfilm, and is furnished on metal reels, suitably labeled. Inquiries concerning purchase should be directed to University Microfilm, 313 N. First Street, Ann Arbor, Mich.

OHIO PUBLIC HEALTH ASSOCIATION

Ohio Public Health Association, with amended constitution and new life, will have its annual meeting in Columbus, headquarters in Southern Hotel, on May 11–12. Among the speakers will be: Thomas Parran, M.D., Pittsburgh, Pa., Granville Larrimore, M.D., Albany, N. Y., and Elizabeth Lovell, North Carolina State Department of Health.

Officers are:

President: F. E. Mahla, M.D., Lucas County
President-Elect: C. A. Wilzbach, M.D., Cincinnati
Secretary-Treasurer: Roy Haines, Bellefontaine

A.P.H.A. membership application blank on page LVII

THE 78TH ANNUAL MEETING

St. Louis, Mo., Oct. 30–Nov. 3, 1950

Hotel Reservation Form

The hotels listed below have rooms available for Association delegates at the rates indicated. Please note that no RESERVATIONS WILL BE ACCEPTED DIRECTLY BY HOTELS. Make your reservations through: *HOTELS CONVENTION RESERVATION BUREAU, A.P.H.A., Room 406, 911 Locust St., St. Louis 1, Mo.*

Hotel	*Single Rooms*	*Double Rooms*		*2 Room Suites*
		Double Bed	*Twin Beds*	*Parlor & Bedroom*
American	$2.75–$4.00	$3.50–$5.00	$4.00–$5.00	$8.00
Baltimore	2.75– 3.50	3.75– 4.50	4.00– 5.00	
Broadview	3.00– 6.00	4.50– 7.00	6.00– 8.00	12.00–18.00
Chase	4.00– 8.00	6.00– 8.00	6.00–10.00	10.00–35.00
Claridge	3.25– 4.75	5.00– 7.50	5.50– 7.50	12.00 & up
Congress	4.50– 6.00	6.50– 8.00	6.50– 8.00	12.00–15.00
De Soto	3.50– 5.00	5.50– 8.00	7.00–13.00	12.00–20.00
Forest Park	3.50– 5.00	5.00– 7.00	6.50 & up	10.00 & up
Gatesworth	4.00 & up	5.00 & up	5.00 & up	10.00 & up
Jefferson	4.50– 6.50	6.00– 8.00	7.50– 8.50	12.00–22.50
Kingsway	3.00– 4.00	4.50– 7.00	6.50– 7.00	
Lennox	3.75– 6.00	5.25– 8.00	6.50– 8.00	11.00 & up
Majestic	3.00– 5.00	4.00– 6.00	6.00– 8.00	
Mark Twain	3.25– 5.00	5.00– 7.00	6.50– 7.00	
Mayfair	3.50– 8.50	7.00–10.00	8.00–10.00	12.00–20.00
Melbourne	4.00– 6.00	5.00– 7.50	6.50– 8.00	12.00 & up
Park Plaza	5.00– 9.00	6.00–10.00	7.35–11.00	9.00–30.00
Roosevelt	3.50– 5.00	5.25– 8.50	7.50–12.00	16.50–19.50
Sheraton	4.00– 6.00	3.80– 5.00	6.00	
Statler	3.75– 6.50	4.50– 5.00	5.50– 7.00	
Warwick	2.75– 3.25	5.00– 9.50	7.00 & up	14.00 & up
York	3.00– 4.00	6.00– 8.00	7.00– 9.00	12.00–17.00

Single Rooms are limited; share a twin bedded room with a fellow delegate. Be sure to use the form below giving the Hotels Convention Reservation Bureau the complete information asked for. This will eliminate unnecessary correspondence for you and the Bureau. All reservations will be acknowledged by the Bureau; and confirmed by the Hotel to which you have been assigned by September 1.

ALL RESERVATIONS MUST BE RECEIVED PRIOR TO: September 18, 1950

Hotels Convention Reservation Bureau, A.P.H.A.
Room 406 — 911 Locust St.,
St. Louis 1, Mo.

Please make hotel reservation as indicated below:

First Choice ..... Second Choice ..... Third Choice .....
(Be sure to give three choices of hotels)
Single Room ..... Double Bedroom ..... Twin Bedded Room .....
2 Room Suite ..... Other Type Room .....
Rate from: $..... to $.....
The name(s) of the occupant(s) of the room will be: .....
.....
.....
Arrival at Hotel ..... hour ..... A.M. ..... P.M. .....
(date)
Departure ..... hour ..... A.M. ..... P.M. .....
(date)

PLEASE NOTE: Hotel accommodations will be held until 6:00 p.m.; later if deposit is made with notification.

Name .....
(Individual Requesting Reservation(s))
Address .....
City and State .....

If the hotels of your choice are unable to accept your reservation the Hotels Convention Reservation Bureau will make as good a reservation as possible elsewhere providing that all hotel rooms available have not already been taken.

EMPLOYMENT SERVICE

The following pages present information for those seeking qualified public health personnel and for those seeking positions in public health.

This is a service of the Association conducted without expense to the employer or employee.

POSITIONS AVAILABLE

Director of Public Health Nursing; academic degree, major in public health nursing, experience in supervision; generalized program; urban area of 76,000 near Milwaukee and Chicago. Nursing staff of 14. Full-time medical director; 42 hour week. Transportation furnished. Commissioner of Health, 730 Washington Ave., Racine, Wis.

Public Health Physician as Health Officer of new single County Health Department beginning July 1. Opportunity of organizing first staff and programs. County of 20,000 on Mississippi River in northwestern Illinois. Salary range $7,200–$9,000. Qualified Health Officer may start above minimum. G. Alzeno, D.D.S. President, JoDaviess Co. Board of Health, Stockton, Ill.

Staff Nurse, excellent supervision; semi-rural and resort area near large city. Minimum requirement, 1 year's training. Salary range $3,000–$3,180 depending upon training and experience. Director, Lenawee Co. Health Dept., Adrian, Mich.

Director of Public Health Nursing to supervise the work of nursing staff of 8. Generalized program in city of 38,000. Salary will depend on qualifications of applicant. Health Commissioner, Health Dept., City Hall, Middletown, Ohio.

Health Officer—full-time, to direct and develop public health program. Population 32,000. Salary $7,200 plus cost of living adjustment and car allowance. John N. Gallivan, M.D., 740 Main St., East Hartford 8, Conn.

Staff Nurses, generalized program, liberal vacation and sick leave, excellent working and living conditions. Salary range $220 to $275, car necessary, travel allowance. Also Assistant Supervising Nurse, salary $250 to $325. Director, McLean County Health Dept., 1009 North Park St., Bloomington, Ill.

Health Educator for the Tacoma-Pierce County Health Department. Quarter of a million population, new Health Center Building. C. R. Fargher, M.D., Director of Health, 2324 Pacific Avenue, Tacoma 2, Wash.

Physician, man or woman for 150 bed tuberculosis sanatorium (new hospital being built). Experience not necessary but desirable. Must be graduate of American school. Salary $6,000. Dr. L. R. Murphree, Morgan Co. Tuberculosis Sanatorium, Decatur, Ala.

Deputy Health Commissioner for well organized County Health Department in Michigan. Must have training in Public Health. Salary $8,000 plus $600 traveling expenses. **Box A-78,** Employment Service, A.P.H.A.

Full-time Health Commissioner. New model unit to be organized. Population 80,000, diversified industrial and agricultural community with excellent advantages and home environment. Salary $9,000 plus $1,000 traveling expense. I. J. Markel, M.D., Chairman, Elkhart Co. Board of Health, 215 W. Franklin St., Elkhart, Ind.

Public Health Physician as Medical Director of Bi-County Health Department in southwestern Illinois. Important public health job to be done. Reasonable salary. Lloyd Cannon, Secretary, Alexander-Pulaski Bi-County Board of Health, Cairo, Ill.

Physician with graduate training in public health as Assistant Director in a well organized urban department of health (including responsibilities for city hospital). Position will involve a considerable amount of responsibility for administrative functions and program planning. Man preferred. Salary will be adjusted to training and experience. **Box Ph-18,** Employment Service, A.P.H.A.

Public Health Nurses for generalized program, including school service. Staff of 40 nurses. Completion of accredited course in public health nursing required. Beginning salary $265. County car, or 7¢ mile for use of personal car. 5 day week; good personnel policies. Kern Co. Personnel Dept., Rm. 119, Court House, Bakersfield, Calif.

Health Officer, Weld County, Greeley, Colo. Salary $7,200 to $8,200; M.P.H. required; entrance salary will depend on

experience. Staff of 14 public health nurses, 3 sanitarians, and a public health laboratory. Field training center. Population 65,000. Also Health Officer for Otero County, La Junta, Colo. Entrance salary $7,200; experience preferred. Population 30,000. Staff of 4 nurses, 1 sanitarian, and a public health laboratory. Good possibility of expansion into district health department. R. L. Cleere, M.D., Executive Director, Department of Public Health, Denver 2, Colo.

Director of Nursing, private agency, city of more than 50,000. Well organized staff of 6 nurses; generalized nursing program including beside care. Well baby center with coöperation of the County Medical Society. Mrs. O. G. Schrup, President, Visiting Nurse Association, 315 West 13th St., Dubuque, Ia.

Qualified Public Health Nurse who wishes experience in a rural generalized health program in District Health Department in Southern Michigan. Liberal salary, adequate travel allowance, vacation, sick leave, and field training program. Headquarters in county seat of 10,000 people. Director, District Health Dept., Coldwater, Mich.

Health Officer — two county district, 80,000 population, well established department. M.P.H. required. Salary from $7,200 dependent on qualifications, liberal travel allowance. Dr. J. B. Ray, Chairman Board of Health, Spray, N. C.

Industrial Hygienist, experienced, age 27 to 38, to take charge of New York area for large midwestern mutual casualty company. Write giving experience and personal history. **Box A-81,** Employment Service, A.P.H.A.

ANNOUNCEMENTS

Opportunities for Health Educators in New York State

The New York Department of Civil Service announces forthcoming examinations to be held for titles in the Public Health field as follows:

Director of Public Health Education	$8,538
Supervising Public Health Educator	$5,232
Senior Public Health Educator	$4,242
Public Health Educator	$3,451
Principal Public Health Educator, Erie County	$6,000 *

* plus $500 cost-of-living adjustment

Applications accepted until April 10, 1950; examination date April 29, 1950.
Application forms and details may be obtained at the following locations:
Examinations Division, State Department of Civil Service, 39 Columbia St., Albany, N. Y.
State Department of Civil Service, Rm. 2301, 270 Broadway, New York 7, N. Y.
State Department of Civil Service, State Office Bldg., Rm. 302, Buffalo, N. Y.
All local offices of the New York State Employment Service.

Opportunities Abroad

1. **Germany**
Public Health and Welfare Adviser, Office of the High Commissioner of Germany. Salary $8,430 plus quarters. M.D. and Public Health degrees required and several years' experience in welfare and health fields necessary. Knowledge of German advisable. Would direct a program for the modernization of German health and welfare in section of Germany, including reorientation for public health and welfare workers. For further information write or call Mr. Beall, Division of Foreign Service Personnel, Department of State, Washington, D. C.

2. **Pacific Islands**
Positions for physicians, public health officers, hospital administrators, laboratory technicians, pharmacy technicians, and nurses are available in Guam, American Samoa, and the Trust Territory of the Pacific Islands. Salaries for doctors will range from $6,400–$8,800 per annum. A post differential of 25 per cent in addition to salary is allowed at present for employees stationed in the islands. Transportation is paid for employees and their dependents. Houses are furnished and rents are reasonable. Further information can be obtained from the Division of Territories and Island Possessions, Department of the Interior, Washington 25, D. C.

3. **Hawaii**
Medical Director, Leprosarium, Kalaupapa, Molokai. Four years of experience as a physician of which two years involved treatment of Hansen's disease patients, and eligibility for medical licensure in Territory required. Salary range $8,280 to $9,280, in addition to board and lodging, 21 days of annual vacation, and retirement plan. Write air mail (six cents) to: C. L. Wilbar, Jr., M.D., President, Board of Health, Honolulu, Hawaii.

Fellowships in Nutrition for Physicians

The School of Public Health of Columbia University in coöperation with the Bureau of Nutrition and the Bureau of Laboratories of the Department of Health of the City of New York wish to make available their facilities for training in clinical nutrition to physicians who intend to use the knowledge acquired for public service either in the academic field or in health departments. For this purpose one or more Fellowships are available for qualified physicians who have had at least an assistant residency in either internal medicine or pediatrics.

These Fellowships are flexible depending on the previous training of the individual, but in general they will consist of one year's training in the School of Public Health with elective studies in nutrition leading to a Master's degree in public health. The second and third years will consist of clinical investigation and research work combining the facilities of the nutrition clinics and the microchemical laboratories of the Department of Health, and the School of Public Health and Columbia-Presbyterian Medical Center.

Fellowships will become available either July 1 or September 1, 1950. The stipend is $3,600 per year, or more depending upon previous training and the needs and requirements of the individual. Inquiry concerning these Fellowships should be addressed to Dr. Harold W. Brown, Acting Director, School of Public Health, Columbia University, New York 32, N. Y.

POSITIONS WANTED

Public Health Physician, M.P.H., veteran, experience in general administration and industrial hygiene including overseas' experience. Good clinical background of hospital and private practice. Interested in position in the United States or abroad. **Box Ph-17,** Employment Service, A.P.H.A.

Health Educator, male, age 35, M.S. in Education and professional diploma—"Specialist in Health Education in Public Health Departments or Voluntary Agencies"; 10 years' experience with city department of health, 4 of which were in the field of community organization. Several years' teaching experience in adult education. **Box HE-18,** Employment Service, A.P.H.A.

Bacteriologist, Male, A.B., plus several graduate courses. Many years' experience in teaching, supervisory position in public health laboratory; research. Desires position in public health. **Box LD-9,** Employment Service, A.P.H.A.

Veterinarian, B.A., D.V.M., desires position in public health work (city, county, or institution) or private industry. **Box V-4,** Employment Service, A.P.H.A.

Health Educator, B.A., M.Sc. in Preventive Medicine and Public Health, University of Minnesota; M.A. in Health Education, Ph.D. Columbia; desires position preferably as teacher of health education in a college or as health educator with public or private organization. Teaching experience in health education, hygiene, and related subjects. Will consider North, East or Western U. S. or Hawaii, Puerto Rico, etc. **Box HE-22,** Employment Service, A.P.H.A.

Advertisement

All communications should be sent to Burneice Larson, Medical Bureau, Palmolive Building, Chicago 11, Ill.

Opportunities Available

PUBLIC HEALTH PHYSICIANS WANTED: (a) Director of public health; generalized program including public health engineering, nursing, education, laboratory, and statistics; staff of 25; department adequately financed; town of 35,000; short distance from university city; South. (b) Director of medical services for island in the Pacific; population, 26,000; will be in charge of public health, quarantine, hospital, treatment services; around $20,000. (c) Public health internist for opening in heart disease program, clinical psychiatrist for children's clinic, child hygiene physician and epidemiologist; state health department; expansion program; East. (d) Director, blood program recently inaugurated; duties: administration, public relations; training in technical aspects of blood transfusion and blood typing desirable, not required; university medical center; opportunity faculty appointment. (e) Public health physician, experienced in teaching, to serve as chairman, department of preventive medicine, university medical school; West. (f) Director of tuberculosis control and, also assistant health officer; large eastern city, university medical center; outstanding men required; minimum starting salaries, $9,000; periodical increases. (g) County health officer; department of 25; northern California. (h) Director of division of geriatrics and adult hygiene; metropolitan health department; Middle West. (i) County health officer; population, 350,000; headquarters in city of 200,000; U. S. dependency. (j) Woman physician to join staff of student health department, woman's college; East. **PH4-1**

WANTED—Public health dentist to direct program for children enrolled in public schools; university town, Southeast. **PH4-2**

WANTED—(a) Health educator; organizing ability required; private agency; eastern city; around $4,000. (b) Sanitary engineer; minimum two years' administrative experience desirable; West. (c) Health educator or public health nurse to serve as coördinator for cerebral palsy nursery, large teaching hospital; well staffed department; Middle West; $5,000. (d) Nutritionist to conduct state health nutrition program; graduate training in public health nutrition required; considerable travel; headquarters, university town. (e) Health educator to serve as curator of education; ability to organize community program, conduct conferences, institutes required; man preferred; large city, university medical center. (f) Executive secretary; tuberculosis agency serving three counties; health educator with voluntary agency experience required; West. (g) Public health engineer; preferably B.S. from college of engineering with academic training in sanitary engineering; minimum three years' experience, preferably in tropical or backward countries; Arabia; minimum $6,000, maintenance and other prerequisites. (h) Health educator; duties consist of producing material in field of health; offices in headquarters of one of leading national professional organizations. **PH4-3**

WANTED—PUBLIC HEALTH NURSES: (a) Generalized public health nursing consultant and, also, supervisory and staff nurses; state department of health; headquarters in college town of 30,000; West. (b) Director of public health nursing program; graduate degree required; outstanding opportunity with eastern university. (c) Director, visiting nurse association; private agency; generalized program; staff of six; college town of 55,000. (d) Public health supervisor; newly organized service; generalized program; Chicago area. (e) Public health nurse to serve as health educator; considerable travel; Illinois. (f) Health service nurse; large teaching hospital; near Chicago. (g) Student health nurse; liberal arts college; administrative ability required; July first; short distance from Chicago. (h) Hospital nursing consultant; headquarters, university medical center; Pacific Coast. **PH4-4**

Opportunities Wanted

Chemical Engineer; B.S. (Chemical Engineering), M.S. (Bacteriology); seven years; research chemist, water department, midwestern metropolis; several years, instructor, bacteriology; four years, chemical research engineer in industry; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Health Educator; M.S., D.P.H.; one year, research fellow, and two years, teaching fellow, university school of public health; five years, associate professor of hygiene and public health; several years, director, health education, state department of health; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Public health dentist; D.D.S., M.P.H., eastern schools; past several years, public health dentist, state department of dentistry; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Public health nurse is available for administrative appointment; Master's degree in education with major in administration and supervision of public health nursing; four years, staff nurse, generalized program; four years, assistant chief nurse, one of country's leading public health nursing organizations; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Public health engineer; B.S. in public health engineering; eight years' experience, including four in South America; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Public health physician; B.S., M.Sc., M.D., Dr.P.H., one of country's leading universities; several years, director, metropolitan health department; two years, associate professor and four years, chairman of department of Preventive Medicine and Public Health, state university; Diplomate, American Board of Preventive Medicine and Public Health; for further information, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

NEWS FROM THE FIELD

A FEDERAL POLICY FOR INDUSTRIAL HYGIENE SERVICES

The Committee on Administrative Practice and the Executive Board of the American Public Health Association have been concerned over the conflicting reports on industrial hygiene in the Recommendations on Reorganization of the Executive Branch of the Government (Hoover Commission) and its Task Forces; and by the pending legislation in the Congress. It has seemed wise to the Executive Board, because of possible timing considerations with regard to national legislation, to be prepared with a simple statement concerning the federal aspects of the problem. A statement as passed by the Executive Board on February 3, 1950, follows:

"There should be a functional division at the federal level between safety problems including accident prevention which should be the responsibility of labor, and occupational disease for which the health agency should be responsible. States should be encouraged to amend their industrial codes where necessary to avoid jurisdictional conflicts."

The Board expressed appreciation to the Industrial Hygiene Section Council for the opinions which were recently submitted and for the statement on "Administrative Practices in Industrial Hygiene." It hopes it has caught the essence of their opinions and has been wise in confining the statement to the federal aspect at this particular time.

1950 BLACKWELL CITATIONS

Five prominent American women physicians have received the 1950 Elizabeth Blackwell Citations for significant contributions to the practice and teaching of medicine. The Blackwell awards were established in 1949 to commemorate the 100th anniversary of the graduation of Dr. Elizabeth Blackwell, the first woman to receive a medical degree in America.

Those receiving the awards were Drs.:

Ruth Morris Bakwin, assistant clinical professor of pediatrics at New York University, director of the pediatric service at New York Infirmary, and assistant visiting pediatrician at Bellevue Hospital, for her work in pediatrics.

Leona Baumgartner, associate chief, U. S. Children's Bureau, assistant commissioner of the New York City Department of Health, for her achievement in improving public health services for children.

Elise S. L'Esperance, pathologist and director of laboratories and of the Strang Cancer Detection Clinic at the New York Infirmary for Women and Children, director of the Strang Cancer Detection Clinic of Memorial Hospital, assistant professor of preventive medicine at the Medical College of Cornell University, cited for her achievements in pathology and cancer detection.

Elaine T. Ralli, associate professor of medicine and chief of the Metabolic Clinic at New York University-Bellevue Medical Center, cited for her work in the study of metabolic and nutritional diseases.

Barbara B. Stimson, orthopedist and director of Services at the St. Francis and Vassar Brothers Hospitals in Poughkeepsie, cited for her work in orthopedic surgery.

A special citation was awarded to Ishbel Ross for her biography of Dr. Blackwell, *Child of Destiny*.

HARVARD BIOCHEMISTRY LABORATORY

A new unit—the University Laboratory of Physical Chemistry Related to Medicine and Public Health—was recently established at the Harvard Medical School. It is directed by Dr. Edwin J. Cohn, professor in the department of physical chemistry and internationally known physical biochemist. The laboratory is designed to make fundamental studies of body fluids and tissues and to extend research upon the physical chemistry of proteins and other biological substances characteristic of all

living matter. A new building for this laboratory will be constructed when funds become available.

COLORADO RHEUMATIC FEVER PROGRAM

The Colorado State Health Department and the Colorado Heart Association are jointly sponsoring a rheumatic fever program in Colorado with the coöperation of the University of Colorado Medical School and the state medical society. Its purpose is to determine the influence of such factors as economic level, crowding in the home, racial descent, and weather conditions on the incidence and prevalence of the disease. The program, with headquarters at West 6th Ave. & Cherokee St., Denver, is directed by George Maresh, Jr., M.D., of the University of Colorado School of Medicine, the facilities of which are being used in the program.

CUTTER LECTURE APRIL 24

The Harvard School of Public Health announces that Dr. Douglas H. K. Lee, Professor of Physiological Climatology in the Isaiah Bowman School of Geography, and lecturer in Physiological Hygiene in the School of Public Health and Hygiene, The Johns Hopkins University, will deliver the Cutter Lecture on Preventive Medicine on April 24, at 5 p.m. in Amphitheatre D of the Harvard Medical School. Dr. Lee's subject is "Physiology as a Guide to Combating Tropical Stress." The Cutter Lectures have been held since 1912. Medical and public health students and others interested are invited to attend.

A.W.W.A. ELECTS HONORARY MEMBERS

At the last meeting of the Board of Directors of the American Water Works Association the following were elected to honorary membership: Jack J. Hinman, Jr., Engineer, Iowa City, Iowa; John H. Murdoch, Jr., Vice-President and Counsel, Water Service Company, New York; and George W. Pracy, General Manager and Chief Engineer, San Francisco Water Department. Mr. Hinman is a Fellow of the A.P.H.A.

VENEREAL DISEASE RESEARCH MEETING

A meeting on venereal disease research sponsored jointly by the American Venereal Disease Association and the Experimental Therapeutics Study Section, National Institutes of Health, will be held in Washington, D. C., April 27–28, 1950.

Papers on *Treponema pallidum*, experimental syphilis and early syphilis, neurosyphilis and other venereal diseases, and the newer antibiotics in syphilis will be given. There will also be a panel discussion on the international aspects of venereal disease control.

Meetings will be held in the Thomas Jefferson Auditorium, U. S. Department of Agriculture, 14th & Independence Avenues, S. W. All persons interested in this phase of medicine are cordially invited to attend. Inquiries should be addressed to Francis L. Schmehl, Executive Secretary, Experimental Therapeutics Study Section, National Institutes of Health, Bethesda 14, Md., or to Dr. William L. Fleming, Secretary, American Venereal Disease Association, 750 Harrison Avenue, Boston, Mass.

ENGINEERS' COUNCIL ELECTS

The Engineers' Council for Professional Development, at its 17th Annual Meeting elected the following officers for the year 1949–1950:

Chairman: Harry S. Rogers, president, Polytechnic Institute of Brooklyn
Vice-chairman: L. F. Grant, Queens University and Royal Military College, Ontario
Secretary: C. E. Davies, Secretary, American Society of Mechanical Engineers
Assistant Secretary: William N. Carey, Secretary, American Society of Civil Engineers

ENGINEERING BIBLIOGRAPHY

The Engineers' Council for Professional Development has recently published a pamphlet, "Selected Bibli-

ography of Engineering Subjects, Section III, Civil Engineering." The pamphlet is broken down into general headings under Civil Engineering with a separate bibliography for each heading. Sanitary engineering is one of the major divisions of the report.

Copies available from ECPD, 29 West 39th Street, New York 18, at 25 cents.

INVESTIGATION OF MINE ACCIDENTS

According to a recent announcement of the Bureau of Mines, U. S. Department of the Interior, every fatality in any one of the nation's coal mines will be investigated thoroughly in an effort to determine the contributing factors and to make recommendations for avoiding similar accidents in the future. This activity, a part of the growing accident prevention work of the Bureau, will also give the Bureau inspectors a chance to carry on with both operators and miners accident prevention education at a time when it is dramatized in their minds by an actual mishap.

MENTAL HYGIENE SERVICES

The San Francisco Department of Health has had a Division of Mental Hygiene in its Bureau of Child Hygiene since 1918. In the 30 years ending July 1, 1948, 19,798 children were cared for through this service. A brief summary of this 30 year experience is now available in mimeograph form from the Department of Public Health, 101 Grove St., San Francisco.

NATIONAL AIR POLLUTION CONFERENCE

The first federal government-sponsored conference on air pollution—United States Technical Conference on Air Pollution—will be held in Washington, D. C., May 3–5, in an attempt to find solutions to the problems of atmospheric contamination. Panels are planned on various phases of air pollution, including meteorology, public health, economics, and legislation, as well as technical aspects of instrumentation, analytical methods, and equipment. The Public Health Service is one of several government departments coöperating in the project. For further information, Dr. Louis C. McCabe, Chairman, Interdepartmental Committee, Department of the Interior, Washington, D. C.

PUBLIC HEALTH NURSING'S NEW EDITOR

Hedwig Cohen, who has been assistant editor for several years, has been made editor of *Public Health Nursing*, the monthly magazine of the National Organization for Public Health Nursing. She succeeds Mrs. Mary Edwards Shaw who has retired to her Cape Cod home after a 7 year editorship.

Miss Cohen is assisted in editing the magazine by a technical expert, Floreida Bush.

MORE REFRESHER LABORATORY COURSES

The January *Journal* (p. 108) announced a 1950 schedule of 23 laboratory training courses by the Atlanta Communicable Disease Center. Since then the Center has added three courses: Diagnosis of Enteric Diseases, March 20–24; Diagnosis of Rickettsial Diseases, November 6–10; Diagnosis of Tuberculosis, December 4–15. Chief, Laboratory Division, Communicable Disease Center, 291 Peachtree St., N.E., Atlanta, Ga.

NORTH CAROLINA'S NEW DEPARTMENT

The North Carolina School of Public Health has organized a new Department of Biostatistics whose "primary function is to offer courses in public health statistics designed to meet the needs of the students in the School of Public Health." It will also provide consultant services to the rest of the School of Public Health, to the Medical School, and the State Board of Health. It will maintain a close working relation with the Institute of Statistics of the Univer-

sity. Currently, it has two research projects under way: one a study of the relative effectiveness of "Pierre, the Pelican," a mental hygiene pamphlet, and one to study physical measurement of school children in differing socio-economic groups, in relation to nutrition.

The head of the new department is Bernard G. Greenberg, formerly statistician with the New York State Department of Health and most recently having completed graduate studies at the Department of Experimental Statistics, North Carolina State College.

GENEVA CONFERENCE ON HANDICAPPED

An International Conference of Experts on the Educational Problems of Orthopedically Handicapped Children was held in Geneva, Switzerland, February 20–25. Sponsored by the International Union for Child Welfare under the auspices of UNESCO, it was attended by approximately 100 representatives of rehabilitation and special services to the handicapped from all parts of the world. Among the United States representatives were James F. Garrett, Ph.D., chief of the Psycho-Social Division, Institute of Physical Medicine and Rehabilitation of New York University-Bellevue Medical Center who spoke on the psychology and special emotional needs of the handicapped child, and Eugene J. Taylor, a member of the editorial staff of *The New York Times* and New York City field representative of the National Society for Crippled Children and Adults, on the training of educational, welfare and nursing personnel.

FLUORIDATION IN WISCONSIN

Wisconsin is taking the lead among the 48 states in the fluoridation of municipal waters for the reduction of dental caries in children under 14 years of age. At present 15 cities add fluoride ion to their municipal waters—Antigo, Ashland, Baraboo, Beloit, Edgar, Elkhorn, Fort Atkinson, Hartford, Janesville, Madison, Mukwonago, Richland, Sheboygan, Soldiers Grove.

Since February, 1946, fluoride has been added in the proportion of 1 p.p.m. to Sheboygan water. Dental caries has shown a reduction of between 25 and 35 per cent, depending on age. Eight other cities have equipment and expect to start a program shortly. Another thirty cities have approved the start of a fluoridation program in the near future, making in all 53 Wisconsin cities that are adopting fluoridation as a public health measure. Most of the cities use sodium fluoride, one is using hydrofluoric acid, one sodium silicofluoride, and one plans to use hydrofluosilicic acid.

FALSE ECONOMY CHARGED TO VA

The Governing Council of the American Psychiatric Association in February passed a resolution in which the Association went on record that various proposed "economy" measures to cut Veterans Administration neurologic and psychiatric services threaten the quality of veterans' care and are wasteful, inefficient, and indefensible on scientific and humane grounds.

The APA's 5,300 members comprise the bulk of practising psychiatrists of the United States and Canada. Its president is George S. Stevenson, M.D., and its medical director, Daniel Blain, M.D., who is in the Washington Office. Among its Council are Drs. Robert H. Felix, William Menninger, and Winfred Overholser.

The resolution follows:

RESOLVED, that the Council of the American Psychiatric Association express its grave concern that measures advanced in the name of economy, but indefensible on scientific or humane grounds, now threaten the quality of service to veterans in need of neurologic and psychiatric care. New hospital construction without competent personnel will not provide adequate care for sick human beings. Current demands that additional hospitals, 16,000 beds (7,000 N.P.), be constructed beyond the availability of profes-

sional personnel in places away from medical centers and in the face of present trends of reduction of personnel ceilings and lowered financial appropriations must result in a deterioration of good medical care to the veteran. Nor is it economical to reduce the efficiency of existing hospitals by removing the consultants in the field as is now occurring with the reduction in force of administrative and supervisory personnel which is going on. Such types of so called economy not only reduce the efficiency of patient care but interfere with the high standard of training in effect in the best V. A. Hospitals to provide physicians for the future.

The recruitment, training, and compensation of doctors in the psychiatric and neurologic service of the Veterans Administration is in sharp competition with the demands and rewards for professional services in civilian life where the economy of early diagnosis and prompt care of neuropsychiatric patients is increasingly realized. Unless the Veterans Administration—and behind it the Congress and the voters—are prepared to recognize the value of well administered programs and the direct as well as the long term economy of early diagnosis and appropriate care, the public might well stand advised that inefficiency, frustration, and general deteriorations in the neuropsychiatric care of veterans will rapidly set in.

Examples of situations where we feel circumstances militating against the best interest of the disabled and sick veteran have occurred or are to take place:

1. Elimination of Branch offices; thus reducing supervision at the field level; with danger of further restrictions.
2. Decrease in funds for travel and consultation; thus cutting down the frequency, availability, and quality of medical supervision.
3. Continued construction of hospitals in isolated areas; thus resulting in staffing problems, forced transfer of physicians to these hospitals, secondary resignations and disturbed morale.
4. Proposed cut for outpatient clinic care will result in increased hospitalizations and decreased care in the community.
5. Lay executive officers have become assistant managers, i.e., acting managers in the absence of managers; thus the very real danger exists of medically untrained nonprofessional personnel assuming control of the care of sick veterans.

SCIENCE WRITING AWARDS

Lester Grant, science reporter for the *New York Herald Tribune*, and George W. Gray, a free lance writer, were presented the annual Westinghouse Science Writing Awards of $1,000 each during the recent annual meeting of the American Association for the Advancement of Science, which administers the awards. Mr. Grant received the newspaper writing award for a series of 15 articles on "The Challenge of Cancer," published by the *Herald Tribune* in 1949. Mr. Gray received the magazine writing award for an article on the human brain, "The Great Ravelled Knot," in the October, 1948, *Scientific American*. Honorable mention in the magazine field went to Herbert Yahraes, a free lance writer, for "How to Keep Away from the Dentist," in *Harper's Magazine* of March, 1949.

The awards were established in 1946 to stimulate interest among young writers in making careers of science writing and to encourage high standards of science writing in newspapers and magazines. Established by the AAAS from a fund granted by the Westinghouse Educational Foundation, the awards honor the founder of the Westinghouse Electric Corporation.

COLUMBIA'S FIRST DR.P.H.

On February 22, Dr. Mohamed O. Shoib of Cairo, Egypt, became the first student to receive the degree of Doctor of Public Health from the Columbia University School of Public Health. The subject of his doctor's thesis is "A Proposed Occupational Health Program for Egypt." He received his Master of Public Health degree at the Harvard School of Public Health in 1948.

Dr. Shoib is in the United States on a three year assignment from the Egyptian Government to prepare himself for developing a section on industrial health in the Ministry of Health. He will also organize a teaching program in industrial health in the Faculty of Medicine in Cairo.

CORRECTION

The February issue of the *American Journal of Public Health*, page 169, lists Salmonella Centers in the United States. Through an error the name of the National Salmonella Center in New York City at Beth Israel Hospital was omitted and should have replaced the name of the New York City Health Department which does not have a Salmonella Center.

A HEALTH TABLOID

A new experiment—or rather an earlier successful experiment put to use once more—is being tried by *Your Health at Work*. This is a monthly tabloid on health facts designed to give workers "stuff about health . . . without fancy lingo but in words they can really understand." The hope of its success is based on the experience of the Brooklyn (N. Y.) Industrial Health Committee which some years ago published a similar tabloid "Here's to Your Health" and found it both popular and useful. The reasons for the demise of this tabloid are not now readily available.

The editor of the new tabloid is Jay I. Boxer, health education consultant, who also edited the earlier one. He now uses the same format, type of paper and print. 972-51st St., Brooklyn 19, N. Y. $1 per year. Group subscription of 25 or more copies to one address, one cent a copy per month plus postage.

PERSONALS

FRED F. ALDRIDGE,* and EMIL E. PALMQUIST, M.D.,* Public Health Engineer of the Seattle-King County (Washington) Health Department, and Health Officer respectively, left in March on a mission in Iran for the U. S. Public Health Service and World Health Organization.

DONALD B. ARMSTRONG, M.D.,* has been re-elected president of the New York Tuberculosis and Health Association.

ANNE M. BAHLKE, M.D.,* formerly medical consultant in the Bureau of Epidemiology and Communicable Disease Control, has been designated as assistant director, Bureau of Medical Rehabilitation in the Division of Medical Services, New York State Department of Health.

ERNEST BAIN has been appointed food sanitarian for the Peoria (Ill.) Health Department, replacing GLEN WOOSLEY resigned.

STANLEY T. BARKER, chief of the sewerage and wastes section of the Bureau of Environmental Sanitation, New York State Department of Health, has been made assistant director of sanitary engineering.

COL. JAMES C. BARTA, formerly chief of the Air Force Veterinary Service, has been loaned to the Colombian Government under the auspices of the Pan American Sanitary Bureau to study the Colombian milk industry and offer recommendations.

MILDRED B. BECK, acting executive secretary of the New York Committee on Mental Hygiene of the State Charities Aid Association, has resigned to become executive director of the Child Study Association of America, succeeding SIDONIE MATSNER GRUENBERG, retired.

I. JAY BRIGHTMAN, M.D.,* assistant director of the Division of Medical Services, New York State Health Department, has been made assistant commissioner for medical services succeeding MORTON L. LEVIN, M.D.,* who is on leave to direct the Commission on Chronic Illness with headquarters in Chicago.

POWELL M. CABOT, chairman of the Massachusetts Development and Industrial Commission, has been appointed business manager of the newly established Harvard University Laboratory of Physical Chemistry Related to Medicine and Public Health.

GEORGE CONNERY, is Editor of American Medical Association's Washington News Service. He was formerly news editor, Columbia Broadcasting Company.

MELVIN E. DAVIS, has been appointed sanitarian, Oregon State Board of Health Restaurant Sanitation Section.

GIDEON K. DE FOREST, M.D., assistant clinical professor of medicine at Yale University and assistant attending physician at Grace New Haven Hospital, has been appointed medical director of the Arthritis and Rheumatism Foundation.

GLEN W. DOOLEN, M.D., formerly chief of the Tuberculosis Section of the Area Medical Office, Veterans Administration, Washington, D. C., has been appointed manager

of the Memphis, Tenn., hospital succeeding FRANKLIN C. CASSIDY, M.D., transferred to the Office of the Area Medical Director, San Francisco, Calif.

MADELENE M. DONNELLY, M.D., M.P.H.,† has been appointed director of the Division of Maternal and Child Health, Iowa State Health Department. She comes from Idaho where she held a similar position in the Department of Health of that state.

HOWARD ENNES,* who has been loaned to the Erie County (N. Y.) Department of Health as director of Health Education, has returned to the Public Health Service, Washington, D. C., and been assigned to the Committee on Publications recently established to study the Public Health Service's program and policies in the field of publications and related activities.

CARL R. FELLERS,* head of the Department of Food Technology, University of Massachusetts, and former chairman of the Food and Nutrition Section, American Public Health Association, has been elected President of the Institute of Food Technologists.

MORRIS FISHBEIN, M.D.,* formerly editor of the Journal of the American Medical Association, has become consultant medical editor for the Blakiston Company and for Doubleday and Company, Inc.

ROBERT H. FLINN, M.D.,* is the newly appointed chief of Health Emergency Planning of the Public Health Service, succeeding NORVIN C. KIEFER, M.D., now on assignment to the National Security Resources Board as director of the Health Resources Division. Both men are medical officers in the Service Commissioned Corps.

CARL FOX,† director of health education for the Illinois Tuberculosis Association since 1948, is the new executive secretary of the Georgia Tuberculosis association.

JOHN T. FULTON, D.D.S.,* dental adviser in the U. S. Children's Bureau, is currently studying children's dental services provided by the New Zealand Health Department, under a WHO fellowship.

RAYMOND GAUTIER, M.D., of Switzerland, has resigned as Assistant Director-General of the World Health Organization to become Research Director of the new International Children's Center in Paris.

JOHN T. GENTRY, M.D.,† has recently joined the New York State Department of Health as a resident in public practice (Apprentice Epidemiologist), assigned to the Glens Falls District.

COL. C. J. GENTZKOW, M.C., AUS (Rtd.), has been appointed Director of the Pennsylvania State Board of Health, Bureau of Laboratories located in Philadelphia, succeeding LT. COL. A. PARKER HITCHENS, M.D., deceased.

MARION F. HARALSON, M.D.,* Medical Officer with the U. S. Public Health Service for over 30 years, has recently retired.

ADOLPH JACOBY, M.D., has been appointed director of the Bureau of Social Hygiene, New York City Health Department, succeeding THEODORE ROSENTHAL, M.D.,† recently appointed director of the Bureau of Adult Hygiene.

RALPH B. HOGAN, M.D., for 2 years chief of clinical and laboratory research, venereal disease division of the Public Health Service, in Washington, has been made chief of laboratory services, Atlanta, Ga., Communicable Disease Center. He succeeds SEWARD E. MILLER, M.D.,* who has become Chicago regional director for the Federal Security Agency.

CLARA JOHNS, M.D.,* health officer of the Lee County Health Department (Ill.) since 1946, has resigned to become a clinical fellow at the Massachusetts General Hospital in Boston.

SARA WRIGHT KELLEY, has accepted a 6 months' appointment as public relations consultant for the Committee on Careers in Nursing, New York, N. Y., to assist with the 1950 student nurse recruitment program.

ERKKI LEPPO, M.D.,† of the staff of the World Health Organization, Geneva, Switzerland, has been assigned to a UNICEF project under the Ministry of Health, Seoul, Korea, advising with reference to maternal and child health in Korea.

DONALD S. MARTIN, M.D.,† formerly professor of preventive medicine and public health, Duke University School of Medicine, Durham, N. C., has been appointed professor of microbiology and dean at the School of Medicine, University of Puerto Rico, San Juan.

CYRUS MAXWELL, M.D.,* formerly chief of administration of school and college health services, U. S. Office of Education, recently joined the Washington staff of the American Medical Association.

DOROTHEA E. NICOLL,* chief of the bureau of nutrition, Massachusetts Department of Public Health, was elected president of the Massachusetts School Health Council at a recent meeting.

JEAN PETERSEN, R.N., who has just completed a semester of study in the Department of Public Health Nursing at Syracuse Uni-

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* Fellow A.P.H.A.
† Member A.P.H.A.

versity, has been appointed public health nurse, Cortland County (N. Y.) Department of Health.

JOHN J. PHAIR, M.D.,* professor of preventive medicine, University of Cincinnati, was a special lecturer at the Puerto Rico School of Tropical Medicine, and at the same time attended the annual meeting of the Puerto Rico Public Health Association, February 6–11.

CORNELIUS B. PHILIP, PH.D., medical entomologist at the Rocky Mountain Laboratory, National Institutes of Health, has been made assistant director of the Laboratory.

HELEN RIECKHOFF, recently with the Ohio State Department of Health is now with the Columbus Health Department to serve as liaison between the Health Department, Council of Social Agencies and various schools of nursing and colleges where curricula calls for field orientation in health and welfare work.

W. K. SHARP, JR., M.D.,† Medical Director, has retired from the U.S.P.H.S. and has been appointed Director of the Bureau of Maternal and Child Health, Alabama Department of Public Health, Montgomery.

WILLIAM P. SHEPARD, M.D.,* third vice president of the Metropolitan Life Insurance Company and President-elect of the American Public Health Association, delivered the Delta Omega Lecture on February 13 at the Harvard School of Public Health, Boston, on "The Training and Recruitment of Professional Public Health Personnel."

ALEX J. STEIGMAN, M.D.,† has been appointed professor of the first chair of child health in the United States under the department of pediatrics, University of Louisville School of Medicine.

BRUCE UNDERWOOD, M.D.,* was reëlected to a 4 year term as Kentucky State Health Commissioner and secretary of the state board of health at a recent meeting of the board.

OSCAR VARGAS, M.D., recently of the staff of the Pan American Sanitary Bureau, has been appointed Director of Health of Costa Rica and has taken over his responsibilities in San Jose.

KENNETH WILLIAMSON, Evanston, Ill. has resigned as assistant director, American Hospital Association, to become executive director of the newly-formed Health Information Foundation, with headquarters in New York City.

J. M. WISAN, D.D.S.,* has accepted appointment as Chief Dental Officer of the Fort Hamilton Veterans Hospital in Brooklyn, N. Y. He has recently been Director of the Joseph Samuels Dental Clinic of the Rhode Island Hospital where he developed a low fee dental care program.

THEODORE F. WISNIEWSKI,† formerly associate public health engineer, Wisconsin State Health Department, has been appointed director of the Wisconsin State Water Pollution Committee.

DEATHS

W. H. CLEVELAND, M.D.,† Director, Lee County Health Department, Mississippi (Health Officers Section).

GEORGE B. FOSTER, JR., M.D., DR.P.H.† Medical Director, Cambridge City Hospital, Cambridge, Mass. (Health Officers Section).

CATHERINE A. GAFFNEY,† Chief Bacteriologist, Kings County Hospital, Brooklyn, N. Y. (Laboratory Section).

GEORGE C. KUESEL, M.D., D.D.S.,† Philadelphia, Pa. (Statistics Section).

STEPHEN R. MONTEITH, M.D.,† Health Officer of the Village of Nyack, Rockland County, N. Y., since 1944 died on December 8, 1949 (Health Officers Section).

GEORGE A. SKINNER, M.D.,† Col. M.C. (Rtd.), professor emeritus of Public Health, University of Nebraska (Public Health Education Section).

LILLIAN R. SMITH, M.D.,† Cape Cod, Mass. (Maternal and Child Health Section).

ARTHUR WEBER,† Long Island City, N. Y. (Food and Nutrition Section).

CONFERENCES AND DATES

American Public Health Association. Headquarters, Kiel Auditorium, St. Louis, Mo. October 30–November 3.

Coming in April, May, and June:

American Association of Medical Social Workers. Atlantic City, N. J. April 21–28.

American Association of Registration Executives. Washington, D. C. April 23.

American Hearing Society. National Conference. Chicago, Ill. June 15–17.

American Heart Association. San Francisco, Calif. June 22–25.

American Medical Association. San Francisco, Calif. June 26–30.

American National Red Cross. Detroit, Mich. June 26–29.

American Pharmaceutical Association. Atlantic City, N. J. Week of April 30.

American Physical Therapy Association. Cleveland, Ohio. June 25–30.

American Psychiatric Association. Detroit, Mich. May 1–5.

American Water Works Association:
Annual Meeting. Philadelphia, Pa. May 21–26.
Canadian Section. General Brock Hotel, Niagara Falls. April 3–5.
Illinois Section. La Salle Hotel, Chicago. April 12–14.
Indiana Section. Purdue University, Lafayette. April 26–28.
Kansas Section. Salina. April 20–21.
Montana Section. Florence Hotel, Missoula, April 21–22.
Pacific Northwest Section. Tacoma, Wash. May 11–13.

Arizona Public Health Association. Buena Vista Hotel, Safford, Ariz. April 20–21.

Colorado Public Health Association. Antlers Hotel, Colorado Springs. May 25–27.

Conference for Health Council Work, Ambassador Hotel, Atlantic City, N. J. April 23.

Connecticut Public Health Association. Yale University, New Haven, Conn. May 17.

Federation of American Societies for Experimental Biology. Atlantic City, N. J. April 17–21.

Georgia Public Health Association. DeSoto Hotel, Savannah, May 1–3.

Illinois Public Health Association. Leland Hotel, Springfield. April 20–21.

Iowa Public Health Association. Savery Hotel, Des Moines. May 3.

Industrial Health Conference. Sherman Hotel, Chicago, Ill. April 22–29.

Institute of Food Technologists. Edgewater Beach Hotel, Chicago, Ill. May 21–26.

International and Fourth American Congress on Obstetrics and Gynecology. Hotel Statler. New York, N. Y. May 14–19.

Kansas Public Health Association. Continental Hotel, Kansas City, Mo. Joint meeting with Missouri Public Health Assn. April 24–26.

Massachusetts Public Health Association:
60th Anniversary Birthday Meeting. Boston, Mass. April 25.
Annual Meeting. University of Massachusetts, Amherst. June 14–16.

Middle States Public Health Conference. Savery Hotel, Des Moines, Iowa. May 4–5.

Missouri Public Health Association. Joint meeting with Kansas Public Health Assn. Continental Hotel, Kansas City, Mo. April 24–26.

National Association of Clinical Laboratories. Philadelphia, Pa. April 13–15.

National Conference of Social Work. Atlantic City, N. J. April 23–29.

National Tuberculosis Association. Annual Meeting. Washington, D. C. April 24–28.

New Mexico Public Health Association. Raton, N. M. May 16–19.

New York State Health Conference. Lake Placid, N. Y. June 5–8.

Nursing Convention. Biennial Meeting of American Nurses Assn., National League of Nursing Education and National Organization for Public Health Nursing. San Francisco, Calif. May 8–12.

Ohio Public Health Association. Southern Hotel, Columbus. May 11–12.

Public Health Conference on Records and Statistics. Washington, D. C. April 24–27.

Royal Sanitary Institute. 1950 Annual Congress. Eastbourne, England. April 24–28.

Southern Branch, American Public Health Association. Birmingham, Ala. April 27–29.

South Carolina Public Health Association. Ocean Forest Hotel, Myrtle Beach. May 22–24.

Tennessee Public Health Association. Noel Hotel, Nashville. May 1–3.

Third International Institute on Organization and Administration of Hospitals. Ministry of Education. Rio de Janeiro, Brazil. June 18–July 1.

United States-Mexico Border Public Health Association. City of Chihuahua, Mexico. April 12–14.

Western Branch, American Public Health Association. Portland, Ore. May 30–June 1.

West Virginia Public Health Association. McLure Hotel, Wheeling. May 4–5.

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